THE EFFECT OF PERSONALITY TYPE ON THE USE OF RELEVANCE CRITERIA FOR PURPOSES OF SELECTING INFORMATION SOURCES

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Even though information scientists generally recognize that relevance judgments are multidimensional and dynamic, there is still discussion and debate regarding the degree to which certain internal (cognition, personality) and external (situation, social relationships) factors affect the use of criteria in reaching those judgments. Much of the debate centers on the relationship of those factors to the criteria and reliable methods for measuring those relationships. This study researched the use of relevance criteria to select an information source by undergraduate students whose task it is to create a course schedule for a semester. During registration periods, when creating their semester schedules, students filled out a two-part questionnaire. After completion of the questionnaire the students completed a Myers-Briggs Type Indicator instrument in order to determine their personality type. Data was analyzed using one-way ANOVAS and Chi-Square. A positive correlation exists between personality type as expressed by the MBTI and the information source selected as most important by the subject. A correlation also exists between personality type and relevance criteria use. The correlation is stronger for some criteria than for others. Therefore, one can expect personality type to have an effect on the use of relevance criteria while selecting information sources.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Early work in Information Science concentrated on the use of information sources in a library, not an everyday context. An example situation might be that of a library patron faced with the task of finding information on a topic. The researcher might try to discover whether the patron would be more likely to consult a catalog or the librarian to find the area of the library to begin searching. The results of such studies led to questions regarding why the library patron might hold certain sources in priority over others. Some of the reasons for that priority are the criteria, known as relevance criteria, that the patron employs when considering multiple sources. It has been suggested that certain internal factors affect the way that relevance criteria are used and information sources selected.

The preceding descriptions of issues in the study of relevance and information retrieval lay the foundation for a more detailed definition of the problem for this research. The problem of this study was to determine whether internal factors have an effect on the use of relevance criteria during the process of information source selection. This study evaluated the effect of one internal factor, personality type, on criteria-based judgments. The data were collected from users during an everyday decision-making process in which they solicit information from an information source, either a document or a person. This

research attempted to answer the question of whether personality, an internal factor, relates to the information source selected and the criteria used to select it.

Research Questions

The specific questions this research attempted to answer were:

1. What relationship, if any, exists between personality type and use of relevance criteria?

2. What relationship, if any, exists between personality type and information source selection?

Certain related subquestions are:

1. Do users consistently apply certain relevance criteria to select certain sources?

2. Do differences and preferences exist among users of certain personality types toward information source selection?

3. If correlations exist among the factors of personality type, information source, and relevance criteria, what is the extent and strength of the correlation?

The goal of the research was to address these problems and provide some answers. Only a small part of the complex issue of relevance tied to human information behavior and judgment has been studied. Yet, most progress in a science is made from incremental work that addresses smaller issues that pave the way to solving major problems. The need for this type of work is more pressing than ever.

In their comprehensive work re-examining relevance, Schamber, Eisenberg, and Nilan (1990, p. 773) present 12 questions for future research. Five of those questions provide the starting point for this work. When reading these questions it is helpful, for the

purposes of this work, to substitute the words “information source(s)” for the word “document(s)” because the questions could apply to all types of information sources and not simply documents. Those questions are:

1. What criteria do users employ in assessing the value (to them) of information (internal and external) in actual information seeking and use situations?

2. Do users employ those criteria consistently? (Are there situational and temporally bound patterns within and across users in the ways criteria are employed?)

3. What characteristics or traits of documents (text, images, etc.) are included in these criteria? (What characteristics are perceived by users?)

4. What document characteristics do users say they want or use when they seek information from systems?

5. Do users say they want or use these characteristics consistently?

Since relevance is a concept central to studies of information retrieval, these questions and others like them become priorities for Information Science studies. In the same article Schamber et al. (1990) state,

> We believe that from an alternative perspective, with its emphasis on the meanings contained in internal cognitions, information science may be able to at last find clues to the meaning of relevance. We see the interaction between information users, users’ situations, and information itself to be a holistic, dynamic, communicative, and interpretive phenomenon. (p. 770)

Even though the article was published ten years ago, the problems are still unsolved and of current interest. Oviatt and Cohen’s (2000) in a recent work also stress the human

element in human-computer interfacing. Their premise is that the balance of human-computer interaction is shifting more and more toward the human elements, such as the internal cognitions and user's situations already referred to, providing another justification for an alternative view of information retrieval. Picard (2000) employs the idea of affective perception to stress the importance of research into factors that effect information retrieval. Briefly, affective perception is the way in which personality and emotion impair or enhance communication, both human-human and human-machine. Both of these articles underscore the current and increasing interest in the complex and multidimensional human aspects of information retrieval. If internal factors can be better understood in their relation to external factors, then it may be possible to achieve more effective and efficient information retrieval.

One problem associated with relevance studies has been the development of consistent, reliable and valid techniques and instruments for measurement of relevance criteria used for information retrieval (Ellis, 1984). Recent work by Schamber and Bateman (1999) have, to a great extent, alleviated that problem. For this research a variant of an instrument developed by Schamber and Bateman was employed.

According to Harter and Hert (1997), one thing lacking in studies of relevance in relation to information retrieval (IR) have been empirical studies. Although their article deals with information retrieval, they specifically challenge information scientists to conduct research to establish "empirical validation of new approaches or metrics" (p. 63). Their charge prompted me to conduct this research as an empirical study in a natural setting, providing at least a partial answer to that challenge. Although this is not

specifically an IR study, it is research into the relationship of several factors during an IR task.

In the same paper they also call for "investigation of new approaches or sources of guidance for development of evaluation strategies and metrics" (p. 63). One goal of this study was to provide insight for guidance of information users during an everyday IR task. The practical nature of the research and its applications should hold a strong appeal for those interested in answering the call of Harter and Hert (1997).

The Information Science Perspective

It has been recognized for some time now that research on IR follows one of two paths: system-oriented or user-oriented (Dervin & Nilan, 1986). System-oriented research focuses on refinements of system technologies, methods of representation, controlled scientific tests, and problems of relevance. User-oriented research tries to understand user behavior and information needs, real-life investigations, and user modeling. Ingwersen (1987) asserts that both paths have implications for information science and may even come together to provide what he refers to as a cognitive focus or cognitive approach. This cognitive approach is more holistic, an attempt to unify the two other approaches. IR is seen as a process involving cognitive states. This research fits more into the cognitive approach for reasons that become clearer later in the paper.

When considering the issue of IR, one method of study is to view user behavior under tightly controlled and artificial conditions. Another approach is to take a common, easily observable IR task and try to understand the underlying dynamics. This study took the latter approach, evaluating participants in an everyday situation where they were in

the process of fulfilling their own information needs. Psychological type was determined for each user using the Myers-Briggs Type Indicator. This study searched for correlations between cognitive states (personality type) and user behavior during an easily observable task to satisfy an information need. Although correlations do indeed exist, they do not imply causation. Further research may supply causes.

Significance of the Study

This research is significant in contributing to the field information science in that it:

1. Produced an empirical study of real users, undergraduate students, who were studied in a natural context. The context is task-based, unlike the narrow human-computer interaction focus of many IR studies. This allowed the study of broad-based, natural factors influencing behavior. A rich matrix of factors was considered. It answers the challenge of Harter and Hert (1997) who urged (a) that more empirical user studies be conducted, (b) that researchers reinterpret IR tasks in a larger context, and (c) that there be more consideration given to multiple evaluation methods and sources of data.

2. Provided proof that a positive and strong correlation exists between relevance criteria, psychological factors, and selection of source. This may make it possible to more closely tailor IR systems to the needs of different groups or individuals. The Schamber et al. (1990) research questions listed earlier in this work contribute to a sense of priority for this research. To summarize the questions, they deal with user employment of relevance criteria, characteristics of information sources, and user awareness of those characteristics.

3. Provided a foundation for applying this theory to use of the Internet, database systems, organization of data, education, and marketing.

Some of the following are examples of where these findings may be applied.

One example of application from positive results of this study may be at universities. A problem common to all institutes of higher learning is retention of students both during the semester and until completion of a degree. Of course, if the problem is one of family strife, job relocation, finances, low intelligence, or poor health the results of this study may not help much. But, all too often the problems of dropping classes or not returning to the university result from poor or non-existing advising of the student. In many cases the wrong advising tool is employed. It is possible that some students may need to speak with an academic advisor because their personality type or culture makes them more comfortable with that approach. It may be that some students prefer the portability of the printed schedule or catalog so that they can examine their choices at leisure while doing laundry or while stuck in a traffic jam. They may not even have access to the Internet or computing tools. Still others may be more comfortable with an electronic schedule on the Internet, preferring the quick approach that does not require that they be in a particular location at a particular time. If the students themselves and the university department advisors are aware of each student's needs and preferences, it may be possible to provide suitable advising. Advisors may be trained to quickly evaluate a student's preferences and to help each student become aware of what does and does not work for them. This can lead to a more stable and comfortable situation for the student

that, in turn, may enhance the probability of the student's return to the same university semester after semester. Satisfied students are good recruiters for a university.

Another application for these research results is in the area of distance education. Certain students may have a better chance for succeeding at distance education courses because of personality or cultural preferences. White (2000) states that others may struggle because they need more human interaction. This research provides insight into why people value certain information sources over others. Therefore, it may provide the framework for advising students in their choice of distance versus traditional educational modes, or even a hybrid (distance course with some time in a traditional classroom) approach. Some students can participate in distance education if they have a healthy dose of human contact to augment the experience. They would benefit from such a hybrid approach.

In the case of the Internet, producers and marketers of information would be particularly interested in knowing of correlations between relevance criteria and psychological type. Kannan, Chang, and Whinston (1998) propose that when members join any E-community they provide information on demographics and psychographics at the time of enrollment. They propose a model of marketing that places weighted values on demographics/psychographics, transaction information, attitudes and beliefs, and interaction dynamics with other members. In the article they mention the Firefly Network. Firefly has created online communities of like-minded people by employing a unique filtering engine. Although this sounds interesting, it could also be boring or very one-dimensional. What if, through a better understanding of the dynamics of

psychological type and relevance criteria, Firefly's engine could point a member toward something or someone they may have overlooked because of internal (psychological type/relevance criteria) bias? The experience for the user would be much richer.

Terminology

Some of the terms used in this study have a long history in the Information Science field. Others have a history in related disciplines.

Relevance

Schamber, Eisenberg, and Nilan (1990) wrote an article with the goal of defining relevance. Although this is a much cited work, it is not the final authority or definitive. Theoretically, relevance is believed to represent the relationship between a user's information problem or need and the information that could solve that problem. Operationally, the definition involves a user's decision to accept or reject any information retrieved from information sources. Relevance is commonly assumed to be cognitive, depending ultimately on human knowledge and perceptions. It is also thought to be subjective, depending on human judgment and not an inherent characteristic of information or a document.

Traditionally there have been two views of relevance. The first is a systems view, concerned with creating retrieval methods that are mechanistic and systematic without relying on human judgment or intervention. The second is an information view that relies on human judgment and cognitive functions. Saracevic, Mokros, Su, and Spink (1991) point out that knowledge and judgments differ in varying degrees from one individual to another. Schamber (1994) describes this view by stating that it "assumes that only users

can make valid judgments concerning the potential ability of information to solve their problems" (p.9). This research takes the second view as its basis for studies.

Relevance Criteria

Schamber and Bateman (1999) define relevance criteria as factors that influence and drive relevance judgments. Operationally, the definition involves a user's decision to accept or reject information based upon relevance criteria. The criteria are inherent characteristics of information or a source. In this study, relevance criteria are selected for presentation to the participants for the purpose of determining if any of the criteria cluster, when measured by order of importance, when used in an IR task.

Task

Bommer, Gratto, Gravander, and Tuttle (1987) define a task as an assignment of work to be completed within a set amount of time. The work can be an internal assignment imposed by oneself, or externally imposed by others. This does not imply complexity, although that may indeed be inherent in the situation.

Media Richness

Daft and Lengel (1986) have proposed that information sources (media) can be rated on a scale from "lean" to "rich" based upon their capacity to facilitate shared meaning. The richness of the media is based on four criteria: (a) the availability of instant feedback; (b) the capacity to transmit multiple cues; (c) the use of natural language, rather than numbers to convey subtleties; and (d) the personal focus of the medium.

Information Source

An information source may be a graphic, a document, or person. It can be anything from which data or information is derived. In this study sources include catalogs, schedules, friends, family, advisors, professors, or any other outside source that the student may consult when determining their class schedules.

Cognitive Styles

The ways in which people differ in handling information has been termed cognitive styles. Even when people have access to the same information in order to solve problems, their approaches to the situation may be radically different from each other. Some have speculated that these styles are related to personality types. Several basic cognitive styles seem to be closely related to the personality factors. Some of these styles deal with the way people gather information. Perceptors and receptors are two examples. People with a perceptive cognitive style focus on relationships between units of the same information in order to gain knowledge of the overall situation. These entity relationships are stressed in various ways and a convergent view is established for task completion. The perceptors look at the larger overall picture. Receptors, on the other hand, focus on details and facts in order to derive knowledge.

Other cognitive styles deal with the way information is evaluated. Some people have an analytical style that employs a structured or deductive cognitive process as they move toward a conclusion. Another style is intuitive, where an unstructured, heuristic, trial-and-error approach is used to reach a conclusion.

Personality Types

Some have speculated that cognitive styles are related to personality types. The Myers-Briggs Type indicator, which is based on Jung's theories of personality types, is used to explain some differences in cognitive styles. It identifies four personality dichotomies.

1. Extraversion versus introversion. Extraverts focus on external stimuli and like variety and action, whereas introverts prefer familiar patterns, rely on their inner ideas, and work alone contentedly.

2. Sensing versus intuition. Sensing types are attracted to established routines, are good at precise work, and enjoy applying known skills. The intuitives like solving new problems and discovering new relationships, but dislike taking time for precision.

3. Perceptive versus judging. Perceptive types like to learn about new situations, but may have trouble making decisions. Judging types like to make a careful plan, and will seek to carry through the plan even if new facts change the goal.

4. Feeling versus thinking. Feeling types are aware of other people’s feelings, seek to please others and relate well to most people. Thinking types are unemotional, may treat people impersonally, and like to put things in logical order.

Social Influences

Fulk and Schmitz (1988) state that behavior is subject to social influence in the form of widespread norms and pressures. Social construction of reality entails some degree of agreement between people on the nature of past events and on appropriate future behavior. Over time, people come to share similar interpretations and parallel

realities that vary as a function of their group membership and of their personal interaction history. The students in this study would have group membership with family and friends. Cultural issues may well play a role in determining which group is the most important to the student.

Summary

The suggestion that certain internal factors affect the way that relevance criteria are used and information sources selected, without the benefit of conclusive proof, has prompted this research on that subject. This study concentrated on the specific internal factor of personality. The research was constructed around an everyday IR task, answering the call of Harter and Hert (1997) for just such studies. A cognitive approach was adopted in an attempt to understand the underlying dynamics of user behavior during the execution of the everyday IR task. The main goal was to determine if personality type had an effect on relevance criteria use for information source selection. A large and growing body of literature pertaining to these ideas is provided in chapter two, where a strong foundation is laid down for this study.

CHAPTER II

Literature Review

Cognitive Research in Information Science

In these first years of the twenty-first century, with the tremendous growth of the service and computer industries in the United States, more employers are requiring cognitive skills of employees than are requiring manual labor skills. This has led to a new class of worker that O'Brien (2000) refers to as a knowledge worker. These people spend most of their work day creating, using, and distributing information. Businesses and other organizations are significantly increasing their attempts to assist the human intelligence and productivity of their knowledge workers with artificial intelligence (AI) tools and techniques. Smith (1987) has shown a strong intersection between cognitive science and AI. This has had the effect of focusing research on human information processing, commonly referred to in Information Science as cognitive studies.

Only in recent years have information scientists begun to develop extensive cognitive studies. Allen (1991) cites Belkin (1990) when he asserts that Information Science cognitive research had its beginning in 1977 at the International Workshop on the Cognitive Viewpoint held in Ghent. Belkin is assuming, and probably rightly so, that Information Science, as a distinct discipline, has not existed for very long. Ingwersen (1987) believes that there may be two distinct paths followed by those pursuing cognitive studies. He asserts that both have implications for Information Science and may even

come together to provide what he refers to as a cognitive focus. The is the development of traditional information systems. This approach expects the user to adapt to the system in order to perform successful information gathering, processing, or retrieval functions. If we accept Ingwersen's statement, this first path may actually be traced back farther than 1977 to the work of Bush (1945) and later to Luhn (1958). The second path he terms user studies. These studies investigate information problems and needs, information-seeking behavior, and the interactions between users and intermediaries. Like the first path, these studies may also predate 1977. Ekstrom, French, and Harman (1976) published a manual for use as a cognition testing kit that employed factor referencing. Newell and Simon (1972) published their work on human information processing even earlier. The time frame should not be an issue, though, as Belkin is only referring particularly to information scientists and the formalization and inclusion of cognitive studies by them.

When the two paths described above are combined or synthesized, Ingwersen (1987) refers to them as a cognitive paradigm. Norman (1986) calls this approach cognitive engineering. Long and Whitefield (1989) refers to it as cognitive ergonomics. Fischer and Lemke (1988) use the term convivial computing to describe the same thing. One hindrance to understanding research in this area is the plethora of terms involved. Regardless of terminology, it is obvious that a need exists to perform user studies and then apply the results toward creating successful and useful information systems. Yet, before these systems are built, it is imperative that human intelligence and the processes involved in cognitive synthesis be researched. This research would have implications for information processing. Taggert and Valenzi (1990) suggest either a rational or intuitive

style of cognitive process depending upon relevance and context. Due to factors including genetics, education, experience, and cultural background, people tend to favor more of one type of processing than the other when information is gathered and evaluated. People with an intuitive style tend to act on a hunch without having to know all the facts. People with a more rational style, however, have to review the facts about a situation and see the bottom line before making a decision. This is described in terms of task performance. Bommer et al. (1987), in their research on ethical and unethical task performances, have developed a behavioral model. In this task assessment model a person is confronted with a task situation. Affecting that situation are environmental factors such as social, legal, professional, and personal. These factors pass through a rich matrix of internal and cognitive filters that are created through accumulation of knowledge and experience, genetic predispositions, and cultural bias. Only those factors and chunks of information that prove relevant are allowed through the filters. This results in a variety of response outputs, such as decisions made or tasks performed. One filter of the matrix is social influence.

Fulk, Schmitz, and Steinfield (1990) state that behavior is subject to social influence in the form of widespread norms and pressures for sense making. Social construction of reality entails some degree of agreement between people on the nature of past events and on appropriate future behavior. Over time, people come to share similar interpretations and parallel realities that vary as a function of their group membership and of their personal interaction history. They state three propositions regarding the pivotal role of social interaction in source media evaluation and behavior.

Proposition 1: Information source evaluations are a function of

1. objective source features
2. experience and skills in using the source
3. prior source use behavior
4. social influences such as norms, direct statements of peers, and social definitions of rationality.

Proposition 2: Task evaluations are a function of

1. objective task features
2. task experience and skills
3. social influences such as norms, direct statements of peers, and social definitions of rationality.

Proposition 3: Information source use is a function of

1. information source evaluations
2. task evaluations
3. situational factors such as individual differences, facilitating factors, and constraints
4. experience and skills in using the source
5. social influences such as norms, direct statements of peers, and social definitions of rationality.

Relevance Research in Information Science

Rouse and Rouse (1984), Dervin and Nilan (1986), and Froehlich (1994) all describe a growing interest in the cognitive processes pertaining to relevance. That

interest has not waned in the intervening years. A very good article outlining the major thoughts, discussions, language, and debates concerning relevance was written by Schamber (1994). That paper is the basis for this overview. Only those citations that pertain in some way to the theme of cognitive processes will be used for this section. Schamber points out that there is a theoretical conception of relevance as well as an operational conception of relevance. Theoretically, relevance is believed to represent the relationship between a user's information problem or need and the information that could solve that problem. Operationally, the definition involves a user's decision to accept or reject any information retrieved from information systems. Relevance is commonly assumed to be cognitive, depending ultimately on human knowledge and perceptions. It is also thought to be subjective, depending on human judgment and not an inherent characteristic of information or a document.

Schamber (1994) describes three traditional views of relevance. The first is a systems view, which is concerned with creating retrieval methods that are mechanistic and systematic without relying on human judgment or intervention. The second view is an information view that relies on human judgment and cognitive functions. Saracevic et al. (1991) points out that knowledge and judgments differ in varying degrees from one individual to another. The question raised is, whose judgment is the best? The third view is a situational view. Schamber describes this view by stating that it "assumes that only users can make valid judgments concerning the potential ability of information to solve their problems" (p. 9). This research assumes the situational view.

Cooper (1973) uses the term utility, which he describes as "a cover term for whatever the user finds to be of value about the system output, whether its usefulness, its entertainment or aesthetic value, or anything else" (p. 89). This definition and viewpoint are very close to that expressed by Kickert (1978) on task completion. When a task must be completed, information is gathered from the environment. According to Taylor (1986), data are gathered by employing six rules or criteria. The criteria are: (a) usefulness of data in context; (b) ability to include, exclude, or focus on specific information (called noise reduction); (c) quality of content; (d) adaptability to respond to the current problem set; (e) time saving; and (f) cost saving. Each factor retained is weighted according to utility or satisfaction before passing on to the next factor.

Measurements Research

A problem that has been discussed with increasing frequency by several disciplines over the years is the development of consistent means of measurement for cognitive processes. Many of the processes are modeled on assumptions derived from the best observable phenomenon. This must be taken into account when embarking upon a discussion of any magnitude on the topic of psychometrics. Rorvig (1988) is a very good source for a historical review of the cognitive measurement effort as it applies to IR. Some of this discussion comes from that article. Other areas addressed in this section are the theory of generalization, factors affecting measurements, and methods of measurement. The works cited here come from several different fields of study with applications directed to those fields.

Some very early work in measuring judgment was conducted by Fechner in the 1850s and 1860s in Germany. He was concerned with understanding why human decision-making was disorderly and inconsistent. Through a series of experiments he hoped to discover a universal law that governed sensory perception. The law he derived from his rather extensive studies is called the log law of sensation. Briefly, this law states that threshold differences in sensation are equal to a constant. The constant is then multiplied by the log of the ratio of the base level of a stimulus to the increase in the stimulus intensity necessary for a difference to be perceived. The constant of the law could then be derived using comparisons of the cases. This law was used for almost a century before being challenged. Variations of this law are still used for certain tests today. The method used to derive the law came to be known as the method of paired comparisons.

In 1927 Thurstone proposed a law gauging the accuracy of human judgment against a predicted Gaussian normal distribution of judgments for stimuli. He used a method that compared value deviations from a normal curve distribution. This corrected an inherent problem in Fechner's approach, namely a reliance on physically observable and empirically measurable paired entities.

In 1946 Stevens described a classification of scales. In order of increasing rigor and precision, they are nominal, ordinal, interval, and ratio. A student working in any basic statistics or methods class will recognize those classifications as still valid today.

Twenty years later a technique known as multidimensional scaling (MDS) began to be used. Its popularity increased significantly in the following years and is still in use.

Carroll and Arabie (1980) have written an article detailing its development and techniques for its use. This is augmented by an approach called the constant-sum method in which scales that are interval and transitive are obtainable.

A study by Shepard (1987) proposes a law of generalization for psychology. He contends

> that people are born with cognitive templates for comparing stimuli. New situations or stimuli are compared against this neotemplate for similarities. Shepard refers to the cognitive workspace as a psychophysical metric parameter space called a consequential region. Although it is not explicitly stated by Shepard, part of the consequential region may control personality development. There may also be applications to social development and social influence. Personality type is of particular interest in this study of relevance criteria and information source selection.

Summary

This chapter followed the threads of ideas that have been promulgated in three areas critical to this research. The first thread followed the several paths of Information Science cognitive research starting from its beginning in 1977 to the current idea of a cognitive paradigm that describes the synthesis of those various paths into one. Cognitive styles, task performance, and social influence are discussed as basic elements of the paradigm. The second thread examined the constructs of relevance, utility, and the gathering of data from an environment. The final thread focused on the foundations of measurements research relevant to this study. These threads are woven together to form the cloth from which this research is cut. The methodology of this research was tailored

to produce a field study. The time, place, methods of data collection, validity and reliability of the instruments, and assumptions are explained in the following chapter.

CHAPTER III

Methodology

Type of research

This research is a quasi-experimental, hypothesis-testing field study. The independent variable is personality trait as measured by the MBTI. The dependent variables are relevance criteria and information source chosen by the user. Direct control of the independent variable, personality type, is not possible. Yet, it is possible to uncover or discover relations and correlations within and between variables. Kerlinger (1992) claims that discovering or uncovering relations is indispensable to scientific advance in the social sciences. He stresses the necessity of knowing the correlates of variables because the meaning of a construct is derived from the relations it has with other constructs.

Two hypotheses channeled the direction of this study. The first hypothesis states that a statistically significant correlation exists between personality type as measured by the MBTI and the use of specific relevance criteria for selecting an information source during an IR task." The second hypothesis states that a statistically significant correlation exists between personality type as measured by the MBTI and the information source selected during an information retrieval task.

Instruments

The hypotheses were tested based on data collected by two instruments administered to undergraduate students. The first instrument, the Information Evaluation Survey (IES) (Appendix B), was created in consultation with Linda Schamber, UNT Associate Professor. This instrument is an adaptation of a survey created earlier by Judy Bateman at UNT for her dissertation (1999). The instrument contains three sections. The first section collects demographic information. The second asks the student to rank, in order of importance on a Likert scale, the information sources available for the task of creating a semester course schedule. There were five information sources. The third section asks the student to rate, using a Likert scale, 25 relevance criteria that he/she employed in the selection of the most important information source.

The second instrument was the MBTI form G. This material was purchased from Consulting Psychologists Press, Inc. (CPP, Inc.). This instrument was developed through the work of Katherine Briggs and her daughter, Isabel Briggs Myers (Myers, McCaulley, Quenk, & Hammer, 1998). Their work is based on the psychological types theories of Carl Jung. He described different ways in which people perceive and judge in combination with differences in attitude. Four distinct dichotomies of personality type were described by Myers and Briggs. Each person exhibits one of each of the dichotomies. When combined, the dichotomies describe 16 distinct personality types.

Participants in this research were given an MBTI questionnaire to complete. The questionnaire was scored using a template provided with the instrument. The calculated

scores described four dichotomies for the participant and allowed the researcher to determine the overall MBTI personality type.

Students were also informed of the availability of an Internet online instrument similar to the MBTI instrument. Scores were automatically computed on the site. CCP, Inc., holder of the MBTI instrument copyright, does not sanction the online site. In order to verify the similarity of the online instrument results to the copyrighted MBTI form G, ten students were chosen at random to take both instruments. The results for all ten students were identical on both instruments.

Official Permission

Permission for this study was granted by several offices and individuals at Dallas Baptist University (DBU) and UNT. The UNT Institutional Review Board for the Protection of Human Subjects in Research approved the study in 2001 (Appendix A) for application number 01-134. The method of data collection and an information form describing the study was approved and was given to all participants before testing (see Appendix A).

A meeting with the DBU Academic Dean and Vice President for Undergraduate Affairs was held. She was given a short presentation and written explanation of the study. After consultation with the legal counsel for DBU, she granted permission for the study to use university students and resources. DBU legal counsel was also made privy to the scope of the research and gave approval for the research to be conducted on campus as long as final results of the research are shared with DBU's Institutional Research Committee.

The Registrar at DBU granted permission for access to student personal information, such as phone numbers, after consultation with DBU legal counsel and the Academic Dean and Vice President for Student Affairs.

Pilot Study

A pilot study was conducted on the campus of Dallas Baptist University to test the effectiveness of the survey instruments and fine-tune the methods of data collection. According to Isaac and Michael (1995, p. 101), an appropriate sample size for a pilot study is between 10 and 30 participants. The pilot study for this research had 50 participants. Undergraduate students from the College of Business (COB) at DBU were the study participants. Initially, a meeting was held with the Dean of the College of Business to explain the purpose of the pilot study and receive permission to conduct the study. The COB agreed to provide students for the pilot. The COB office provided a list of student names. Fifty students were selected at random by calling every fifth student on the list and asking him/her to come to the COB office to participate. The first 50 students contacted agreed to participate. Each student was given an explanation of the research and assured of confidentiality and anonymity. Some business professors, upon hearing about the study, volunteered their class members as participants. Each student was assured of anonymity. A videotape was created which contained instructions for the students. This tape was used when I was not physically available.

Prior to testing, all students were given an information form along with an explanation of each instrument they were to complete. The students completed two surveys, the IES (Appendix B), and an MBTI personality inventory instrument.

Following testing, identification numbers were assigned to each survey and for each participant. From the scores on the IES and MBTI, conclusions were drawn to enhance the sampling and data analysis procedures to be used in the main study.

The demographics in the following table reveal some of the diversity of the pilot study group.

Table 1.

Demographics of the pilot study group

Age Range	N	Male	Female	U.S. Citizen	non-U.S. Citizen
16 – 20	10	26	24	36	14
21 – 30	30				
31 – 40	5				
41 – 50	5				
Over 51	0				

Note: There are a large number of students represented in the lower age ranges. Non –U.S. citizens participated heavily in the pilot study.

In fall 2001 DBU had approximately 4,000 undergraduate and graduate students with about 2,000 students taking courses on campus. The students come from the United States and 45 other countries. Of the 16 possible MBTI personality types, 13 were represented in the final sample. The number of students per type spread out over the 50 students was small, with one type (ISTJ) being represented by 10 students, or 20% of the sample population total. Most types were represented by two to four students. Initially I

thought I could do a chi-square evaluation of each personality type and the information source chosen. With such a small representation from each type, however, chi-square used in that fashion was impractical. Clearly another approach was needed. After some consideration, I employed a salient feature of the MBTI. Personality type, according to the MBTI, is divided into four major dichotomies. Every person falls into one of the two categories in each of the four dichotomies. A chi-square value could be calculated for each dichotomy and its corresponding selected information source.

The participants were given five information sources from which to choose. This provided four degrees of freedom. According to the standard chi-square table for four degrees of freedom at the .05 significance level, the value for significance is 9.49. Even using the approach described above, none of the chi-square values were significant. In every case the indication was that the observed differences could be attributed to chance. After some consideration I decided to project the numbers using a 6-to-1 (300/50) ratio in order to see what comparable values would be like if the sample size were 300. With this approach, in all but one case the values were statistically significant. It should be noted that the use of only the dichotomies of the MBTI types is not a normal or approved procedure. It was only used in this case to achieve sufficient sample size for analysis. Although the results did not necessarily imply significance or nonsignificance, they were intriguing and seemed to warrant a full-scale study.

Sampling

The sample for the main study was chosen from all undergraduates at DBU. This university has an undergraduate population size of about 3,300 students, 2,000 of whom

attend classes at the main campus. An appropriate size for a random sample from a given finite population of *N* cases is such that the sample proportion *p* will be within + or - .05 of the population proportion *P* with a 95% level of confidence (Isaac & Michael, 1995). Where *N* is 2,000, this is about 300. In this study with many variables being researched, a larger sample was required for statistical analysis. An example is the chi-square test. MBTI describes 16 personality types. If personality types were evenly distributed, the minimum sample size for the study would be 560. The real sample, however, had to be large enough to attain a frequency of 35 for the least common personality type. The sample for this study was 984 students, with a frequency of 37 for the least common personality type.

The DBU Registrar provided a list of all undergraduates for the study. Every fifth student on the list was contacted by phone and asked to participate based on consecutive passes down the list. In the first pass every fifth student was called, starting with the fifth student on the list. The second pass started with the name of the sixth student and every fifth student from there to the end of the list. The third pass started with the seventh student and every fifth student from there to the end of the list. Follow-up calls were made to those who agreed to participate but did not show up at the appointed time. This pattern was followed until all names had been called and the one-year time limit imposed by the UNT IRB was completed.

Data Collection

Data were collected in the fall, winter, and spring semesters of 2001-2002. DBU is a sectarian institution of higher education associated with the Southern Baptist

Convention in the United States. Chapel attendance is mandatory for undergraduates. Services are held three times a week. Announcements were made in DBU chapel services for two weeks in late August 2001 explaining the study and asking for volunteers. Some professors, upon hearing about the study in chapel, volunteered their class members as participants. Each volunteer was assured of anonymity.

Extra IES and MBTI instruments along with explanation sheets were made available to students in the DBU Library in case students wanted to participate at times when I was not available on campus.

Students were told of the availability of an Internet online instrument similar to the MBTI instrument. They could take either instrument. After completing the online instrument, they printed out the report results and attached it to their IES. A reasonable facsimile of a printout from the online session is included in Appendix D.

Prior to testing, participants were given an information form describing the study along with an explanation of each instrument to be completed. During the time that a participant was completing the instruments, the researcher answered questions of a general nature regarding the exercise, without discussing the content of the surveys.

Following testing, the MBTI and IES results for each student were attached filed together according to MBTI type. MBTI and IES results were scored and entered into a spreadsheet. Ambiguous or incomplete results were discarded. Some students went against researcher directions and printed their names on the instruments. Those names were either erased or blacked out on the instruments.

Methodological Issues

Certain facets of research must be addressed regardless of study type or method. The issues of validity and reliability of instruments used for any study must be answered. Assumptions of the researcher must be taken into account. Any objections or negative aspects of research type or instruments should be noted. One goal of good research is to allow those who follow to be able to replicate the work. If all of these issues are addressed, the researcher provides a clearer road map for subsequent researchers. This section provides insight into validity, reliability, and assumptions regarding this study.

Validity

Field studies exhibit certain strengths. One is realism. Of all types of studies, they are closest to real life. The more realistic the research situation, the stronger the external validity and the more generalizable the results. This study of relevance-based evaluation behavior was conducted in realistic IR situations. Harter and Hert (1997), in their article dealing with IR evaluation, specifically challenge information scientists to conduct research to establish "empirical validation of new approaches or metrics" (p. 58). In light of their charge, this study contributed to empirical testing of the IES as a new criterium-based evaluation instrument. One goal of this study is to provide insight for guidance of information users and information providers during a common IR task. The practical nature of the research and its applications demonstrates the strengths of this study.

Although the statements of relations between variables are perceived as weaker in field studies than in experimental research, they can be bolstered considerably through the use of certain techniques. Statistical methods such as analysis of variance (ANOVA)

and chi-square can be employed, as they are in this study. Random sampling and attention to detail in data collection also contribute to strengthen this study. Error and deviation are accounted for in order to avoid making inaccurate generalizations about the results.

Field variables present a challenge because they are hard to measure with precision. To overcome this, valid and reliable instruments were used. Both tests used in this study achieve face validity. With regard to the IES (Appendix B), Schamber and Bateman (1990) state that "content validity of the criterion concepts is supported by verification and clarification through tests with 350 users, as well as by previous findings on relevance evaluation in general" (p. 6).

There are two main kinds of evidence for the validity of the MBTI:

1. Relationships with other personality measures.
2. Relationships with behavior, either of a complex kind, or of a much more simple kind.

Thorne and Gough (1991) conducted some very high-quality research into the validity of the MBTI. They analyzed information gathered over a period of 30 years in a center for studying personality and creativity. Their study has shown strong validity for the MBTI. The best evidence so far for the MBTI validity is its relationship with measures of the Five-Factors personality model. The model comprises five personality dimensions: (a) Openness to experience, (b) Conscientiousness, (c) Extraversion, (d) Agreeableness, and (e) Neuroticism (OCEAN), sometimes known as the Big Five. Five-factor theory dominates current research on personality. There is a close relationship

between the Big Five and the MBTI preferences, so research on the Big Five is, in effect, research on the MBTI. The extensive, high-quality validity research on the Big Five supports MBTI validity. The relationship between the two theories is strong enough to provide good evidence for the MBTI construct validity.

Reliability

Both instruments used in the study stand up to the test for reliability. Variations of the IES have been used in several different contexts with consistent results.

Schamber and Bateman (1999, p. 6) describe a series of studies intended to develop and test the instrument with hundreds of participants. They report that the instrument yielded dependable and accurate results every time it is administered. Although these findings have not yet been statistically tested, they help support the reliability of the instrument. This dissertation study promises to make an important contribution to that effort.

The MBTI is a well-known and widely-used instrument in a number of different fields of study. The reliability of the MBTI is affected by such factors as age and achievement level of people completing it. However, on average it is 80% reliable, which is generally regarded as good for a personality measure. Moreover, when someone's MBTI results change, it is most likely to occur in only one of the preferences and also when the score of the first set of preference results is low.

Assumptions

There are four major assumptions for this study. The first assumption is that relevance is dynamic, multidimensional, and complex. It involves both internal

(personality, etc.) and external (situation, etc.) factors. A theoretical conception of relevance, as well as an operational conception of relevance, exists. Theoretically, relevance is believed to represent the relationship between a user's information problem or need and the information that could solve that problem. Operationally, the definition involves a user's decision to accept or reject any information retrieved from information systems. Relevance is commonly assumed to be cognitive, depending ultimately on human knowledge and perceptions. It is also thought to be subjective, depending on human judgment and not an inherent characteristic of information or a document.

The second assumption is that a small, private, sectarian university provides enough diversity to be typical of university undergraduate populations as a whole. In fall 2001 DBU had approximately 3,300 undergraduate students representing the United States and 45 other countries. Approximately 20% of the undergraduates could be classified as from a minority group. The fact that Dallas is a large metropolitan area contributes to the diversity of DBU.

The third assumption is that scores for the sample drawn from the DBU population are normally distributed. In other words, the sample is a good cross-section of the DBU population with proportionate representations. There are two techniques commonly used to achieve this. One is to provide for methods of randomly sampling the population, and the other is to attain a large sample. This study used both techniques. The primary was systematic sampling, calling every fifth name on a student phone list. Two other methods were also used. One was to provide for walk-in volunteers who filled out the surveys unsupervised using material and explanations that were made available to the

public in the DBU library. The second method was the provision of classes of students by professors who wanted to help with the study. In that situation the professors allowed me to collect data during a class period. The final sample was large, with 984 students.

The fourth assumption is that personality type is a valid construct of an internal psychological factor. This carries with it the assumption that it can be reliably measured.

Criticisms of the MBTI

Every instrument used for measurement in scientific research should be scrutinized. No instrument is perfect but many are effective, proving their reliability and validity over time. Like most instruments, the MBTI has had its share of critics. Some of the criticisms are given because of a lack of understanding of the purpose of the test. Because the MBTI is a measure of behavior, many of the critics attack that particular aspect of personality. A common remark is that behavior is different in different situations. People are adaptable and flexible. Their behavior is different depending on the situation. It is possible to predict their behavior most of the time, according to their MBTI preferences. Another critic may posit that people's responses on personality questionnaires, do not reflect the way they behave in real life, only how well they do on tests. Personality questionnaires are too simple and it is easy to fake answers. Nevertheless, the major personality questionnaires work fairly well, in practice, as measures of what people are like in real life.

Another criticism leveled at the MBTI is that the measures of the MBTI only work and are consistent for people in the United States. It is true, though, that there are over 20 different language translations of the MBTI. All 16 types are found universally in

all cultures tested. So far, the only country for which a reasonable sample of the general population exists is the USA.

A last criticism to consider is one that is also voiced over other survey-type instruments. A critic may say that the MBTI does not allow for a third answer of "both" to its questions. True, the MBTI can be frustrating to some people because it asks for a choice between two opposites, or dichotomies. It assumes that people use all the preferences, but it asks which one from each pair is preferred. MBTI results simply indicate those preferences. This is consistent with the theory.

Method of Evaluation

The data were evaluated a number of ways. Correlation coefficients were analyzed. An ANOVA was performed, both within groups and between groups. There are 16 different personality types, 25 distinct relevance criteria, and five different information sources. Standard deviations, standard errors of means, and standard variances of means were also calculated.

Summary

This research was conducted in a manner that would allow it to be repeatable and also allow for future research. Although randomization was not always possible, it was the chief approach to gathering responses. The questions and hypotheses are clearly stated, and the research was designed specifically to them. The validity and reliability of the instruments used for assessment provided a measure of confidence when studying the results. The number of variables and the large sample size make this a very rich study.

CHAPTER IV

Findings and Analysis

This section provides an analysis of the data collected for the study. The demographics of the sample population, the procedures for scoring the data, analysis of variables in relation to information source, analysis of variables in relation to relevance criteria, and certain non-parametric statistical measurements are included in the following discussion.

Demographics of the Sample Population

It was important that the sample exhibit a good cross-section of the student population for reasons of experimental rigor and generalization to the larger population of all undergraduates. The sample was collected, for the most part, in a random fashion from the Dallas Baptist University undergraduate population. In fall 2001 DBU had approximately 3,300 undergraduate students, with about 2,000 students taking courses on campus. The students came from 45 countries and the United States of America. There were 290 students who were not citizens of the U.S.A. Of all students attending the university, 818 students lived in campus housing. DBU is generally regarded as a commuter university, although lately campus apartments have been built in an effort to increase the on-campus population. Approximately 1,300 undergraduate students were male and 2,000 were female. Approximately 20% of the undergraduates could be

classified as from a minority group. All DBU population data in this chapter are from the DBU Office of Institutional Reporting.

Age Representation

A quick glance at Figure 1 shows a clear majority of the students came from age ranges that are traditionally associated with undergraduate studies. The large number of participants in the younger age ranges is expected because the sample comes from only the undergraduates. Yet DBU, along with most institutions of higher learning, has experienced a rising trend in older people going back to the universities to complete degrees. Approximately 20% of the sample was represented by age ranges over the age of 30.

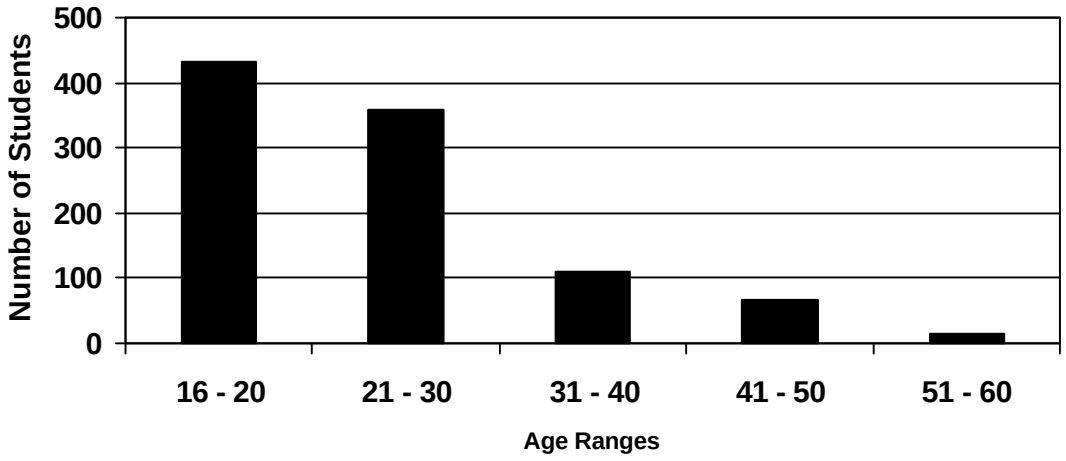


Figure 1. The number of students for each age range represented in the sample. Note the wide range of ages represented. The total sample number was 984.

Gender Representation

DBU had approximately 3,300 undergraduate students during the course of this study. Of the 984 students who participated in the study, 400 were male and 584 were female. In Figure 2 the percent of each gender represented in the general undergraduate population of DBU is compared against the percent of each gender participating in the study. The ratio of male to female demonstrates very little difference from that for the general population of the university.

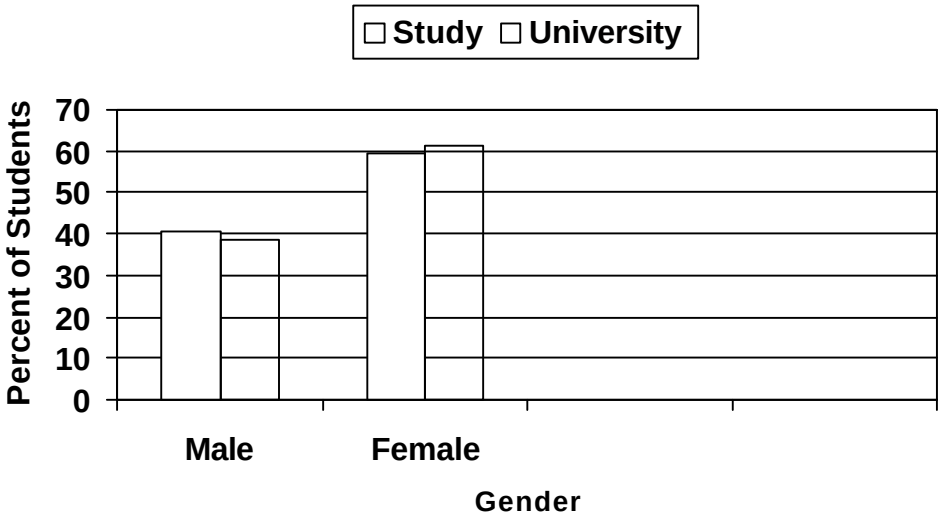


Figure 2. The percentage of male vs. female participants in the study.

Class Standing Representation

The proportions of the classes represented in the study, as seen in Figure 3, show very little difference from the proportions of the general population of the university. The actual numbers of participants in the study by class were 336 freshmen, 159 sophomores, 207 juniors, and 282 seniors. The large number of freshman is not surprising. In most universities the freshman class is the largest and the class sizes decrease after the

freshman year. DBU has an Adult Studies Program that allows adults who have not been in college for a number of years, but who have some college hours, to petition for additional hours based on work experience. Most adult students come into the program as seniors.

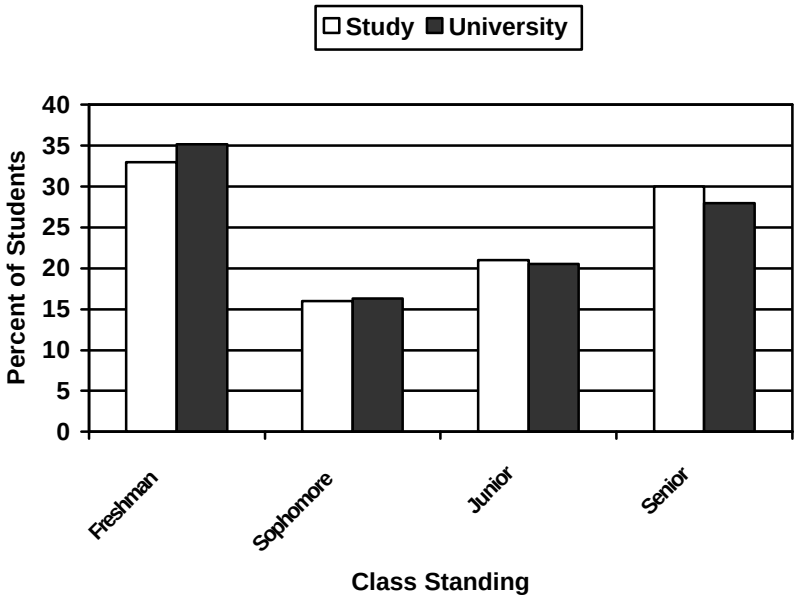


Figure 3. The percentage of each class that participated in the study. This is compared with the percentage of each undergraduate class represented at DBU.

Major Representation

DBU offers undergraduate and graduate degrees in 43 majors. The largest unit, the College of Business, offers the largest number of majors. Note the large number of students claiming Business as a major. In the general university population, students claiming business as a major in the 2001-2002 academic year represented approximately 47% of all undergraduates. Nearly half (49%) of the students in the study were freshmen

or sophomores (49%) who may have been unsure of their majors and chose business by default.

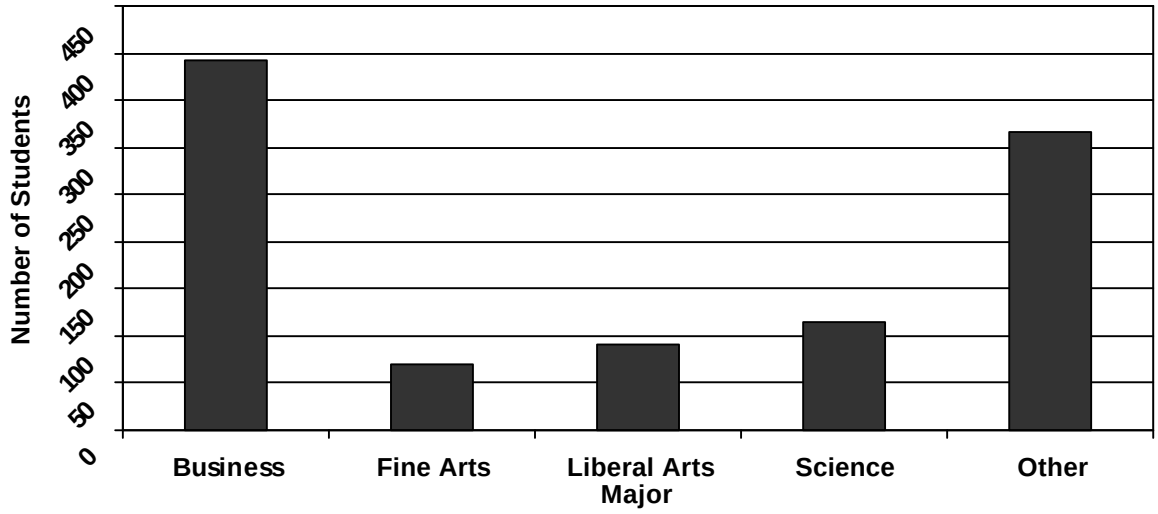


Figure 4. The number of participants in the study represented in each major.

Citizenship Representation

DBU has a relatively large population of students from countries other than the U.S.A. At DBU they are referred to as international students. In the 2001-2002 academic year, DBU had a population of 290 students who were not U.S. citizens. One hundred and fifty six, or 54% of the DBU international student population, participated in this study. This may be due to several factors. One might be a desire to help with a study conducted by a professor at their university. Another might be a desire to participate in an activity they view as an American custom, along with their American friends.

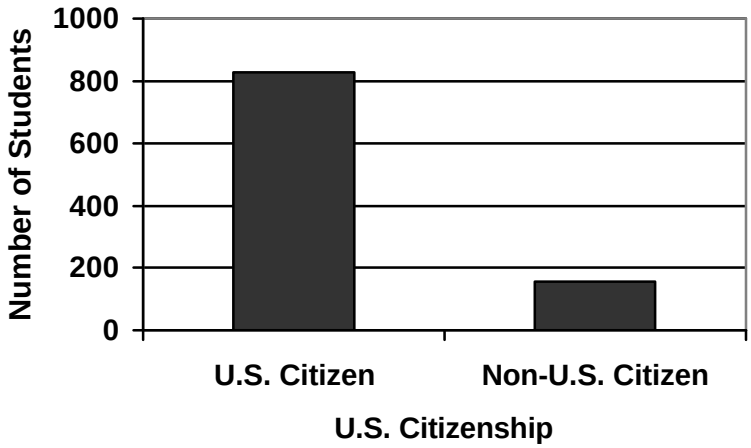


Figure 5. The number of participants in the study who claim U. S. citizenship compared with non-citizens.

Myers-Briggs Type Indicator (MBTI) Representation

The Myers-Briggs Type Indicator has been administered to thousands of people, and the normal distribution of its sixteen distinct personality types is well established. In Table 2 the percent of each personality type represented in the study is compared to the percent of each personality type represented in the general U.S. population. Of the 984 participants in the study, 56% expressed the extraversion dichotomy of MBTI type while 44% expressed the introversion dichotomy. Younger age groups more often have higher percentages of extraversion than older age groups. The large number of extraversion participants should not be surprising. Also take into account that some of their traits are eagerness for interaction with the outer world and an action-oriented approach to new experiences. Another consideration is educational level. Groups with higher educational levels normally have higher levels of introversion than those with lower education levels.

The largest number of respondents in this study for both the I and E dichotomy types were S(ensing), F(eeling), J(udging) expressed. In a national sampling of university students, Myers, McCaulley, Quenk, and Hammer (1998, p. 381), the top six personality types for women were ESFJ (15.05%), ENFP (11.74%), ISFJ (11.47%), ESTJ (8.68%), ESFP (8.33%), and ISTJ (6.86%). For men the top six were ESTJ (12.81%), ISTJ (12.48%), ISTP (6.81%), ENTP (6.77%), ESTP (6.72%), and INTP (6.63%). Table 3 shows the frequencies for MBTI by gender for this study. Figure 2 shows the large number of females (59.3%) represented in the study. This may explain the large percentage of ESFJ, ISFJ, and ISTJ types in the sample. Also, it must be noted that most professors express the Thinking and Intuitive dichotomy types. At DBU the professors are expected to help with recruitment. Since professors will probably recruit students with whom they relate easily, this may explain the prominence of some types.

Table 2

The Number of Participants by MBTI Type

MBTI Type	N	% of Study	% in U.S. Population
ESFJ	123	12.5	12.3
ENFJ	104	10.6	2.5
ISFJ	82	8.3	13.8
INTJ	75	7.6	2.1
ENTJ	74	7.5	1.8
ISTJ	63	6.4	11.6
ESTJ	62	6.3	8.7
ENFP	57	5.8	8.1
ESTP	50	5.1	4.3
INFJ	48	4.9	1.5
INTP	43	4.4	3.3
ESFP	43	4.4	8.5
ISFP	43	4.4	8.8
ISTP	41	4.2	5.4
ENTP	39	4.0	3.2
INFP	37	3.8	4.4

Table 3

Frequency of Gender for Each MBTI Type

MBTI Type	F	M
ENFJ	69	35
ENFP	34	23
ENTJ	34	40
ENTP	17	22
ESFJ	93	30
ESFP	29	14
ESTJ	31	31
ESTP	28	22
INFJ	33	15
INFP	12	25
INTJ	40	35
INTP	12	30
ISFJ	69	14
ISFP	27	16
ISTJ	38	25
ISTP	18	23

Many studies of MBTI reflect various attributes of the dichotomies. A further view of the frequencies of the major groupings provides a fuller picture of the demographics. In Table 4 the frequencies of MBTI by age range are seen. Younger age

groups are most often represented with higher percentages of extraversion than older age groups. Also the majority of students in the study are female (59.3%). In a national sampling of university students, Myers et al. (1998, p. 381) found the top six personality types for women were ESFJ (15.05%), ENFP (11.74%), ISFJ (11.47%), ESTJ (8.68%), ESFP (8.33%), and ISTJ (6.86%). Therefore, the large number of extraversion participants should not be surprising.

Table 4

Frequency of Age Ranges for Each MBTI Type

MBTI Type	16-20	21-30	31-40	41-50	51 and over
ENFJ	47	35	12	9	1
ENFP	29	21	3	3	1
ENTJ	33	18	14	5	4
ENTP	17	13	8	1	0
ESFJ	77	27	7	10	2
ESFP	24	12	4	3	0
ESTJ	25	19	10	6	2
ESTP	24	24	2	0	0
INFJ	21	20	4	2	1
INFP	11	23	2	1	0
INTJ	14	36	15	9	1
INTP	25	13	3	1	0
ISFJ	40	21	10	8	3
ISFP	16	28	2	0	0
ISTJ	23	18	14	7	1
ISTP	10	29	1	1	0

In Table 5 the frequencies of citizenship, U.S., and non-U.S. are compared for each personality type. The international students in the DBU population come from 45

countries. It is difficult to compare these data because some earlier studies of MBTI were conducted only for specific countries. Many DBU students come from Asian rim countries, but it would be incorrect to draw conclusions based on an earlier study of a single Asian country, such as Korea. Also, many of the students are from western or eastern Europe. In many cases the countries are small and newly formed from the former U.S.S.R. Studies do not exist for those countries so comparisons are not possible.

Table 5

Frequency of Citizenship for Each MBTI Type

MBTI Type	U.S. Citizen	Non U.S. Citizen
ENFJ	90	14
ENFP	44	13
ENTJ	67	7
ENTP	38	1
ESFJ	109	14
ESFP	30	13
ESTJ	53	9
ESTP	43	8
INFJ	33	15
INFP	34	3
INTJ	68	7
INTP	36	6
ISFJ	74	8
ISFP	28	15
ISTJ	50	13
ISTP	31	10

Frequencies for major (Table 6) show some important trends. The Other category includes Education, Interdisciplinary Studies, Kinesiology, and Biblical Studies. Note the large number of students claiming Business as a major. Again, students claiming business

as a major in the 2001–2002 academic year represented approximately 47% of all undergraduates.

Table 6

Frequency of Major for Each MBTI Type

MBTI Type	Business	Fine Arts	Liberal Arts	Science	Other
ENFJ	33	6	11	10	44
ENFP	21	6	7	5	18
ENTJ	31	5	8	9	21
ENTP	10	1	1	13	14
ESFJ	50	9	9	11	44
ESFP	18	1	4	1	19
ESTJ	28	0	6	6	22
ESTP	17	5	5	7	16
INFJ	22	5	7	3	11
INFP	10	4	5	6	12
INTJ	36	2	5	9	23
INTP	10	2	3	10	18
ISFJ	32	6	13	6	25
ISFP	25	0	0	9	9
ISTJ	35	5	5	7	11
ISTP	15	12	2	2	10

The last consideration for MBTI frequencies is class standing. In Table 7 freshmen, the youngest and largest age and class group, is heavily represented by the E dichotomy. The senior class, representing the older age group, also has more of the E than the I dichotomy. This may be explained by the fact that 188 seniors are female while only about half that number (95) are male. In a national sampling of university students, Myers et al. (1998, p. 381), the top six personality types for women were ESFJ (15.05%), ENFP (11.74%), ISFJ (11.47%), ESTJ (8.68%), ESFP (8.33%), and ISTJ (6.86%). Therefore, the large number of extraversion participants in the senior Class should not be surprising.

Table 7

Frequency of Classification for Each MBTI Type

MBTI Type	Freshman	Sophomore	Junior	Senior
ENFJ	48	16	16	24
ENFP	27	7	12	11
ENTJ	28	5	21	20
ENTP	9	9	9	12
ESFJ	69	11	11	32
ESFP	18	11	6	8
ESTJ	20	6	13	23
ESTP	14	10	14	12
INFJ	17	2	8	21
INFP	7	6	13	11
INTJ	11	12	19	33
INTP	10	21	10	2
ISFJ	28	14	13	26
ISFP	10	8	9	16
ISTJ	17	10	20	16
ISTP	3	11	13	14

Information Source Considerations

One of the dependent variables in this study is Information Source. It is commonly accepted that the word source may refer to a graphic, a document, or a person. It could well be anything from which data or information is derived. For this study the list of sources includes university undergraduate catalogs, printed class schedules, friends, family, advisors, professors, or online class schedules. In this study the data were collected from undergraduate students during the real-life, decision-making task of creating a semester course schedule. During the process, the students search and solicit information from an information source, either a document or a person. The following figures and tables allow an analysis of which information source was the most important and provide some answers to the question of why that source is important.

Information Source Statistics

Students who participated in the study were asked to rank information sources in order of importance from most important to least important. For this study the list of sources includes university undergraduate catalogs, printed class schedules, friends, family, advisors, professors, or online class schedules. Some students did not follow the instructions and ranked several of the sources the same. Those surveys were discarded from the study. The results of the survey for information source ranking are shown in Figure 6. Notice that the sources ranked in order of importance are printed schedule, printed catalog, professor/advisor, friends/family, and online schedule. The catalog probably ranks so high in the order because it provides a listing of pre-requisite courses and a sample degree plan for each major. Students refer to it to determine which courses

to take next in the requisite order. At some universities the catalog is referred to as the Bulletin. At DBU the printed catalog is updated every two years.

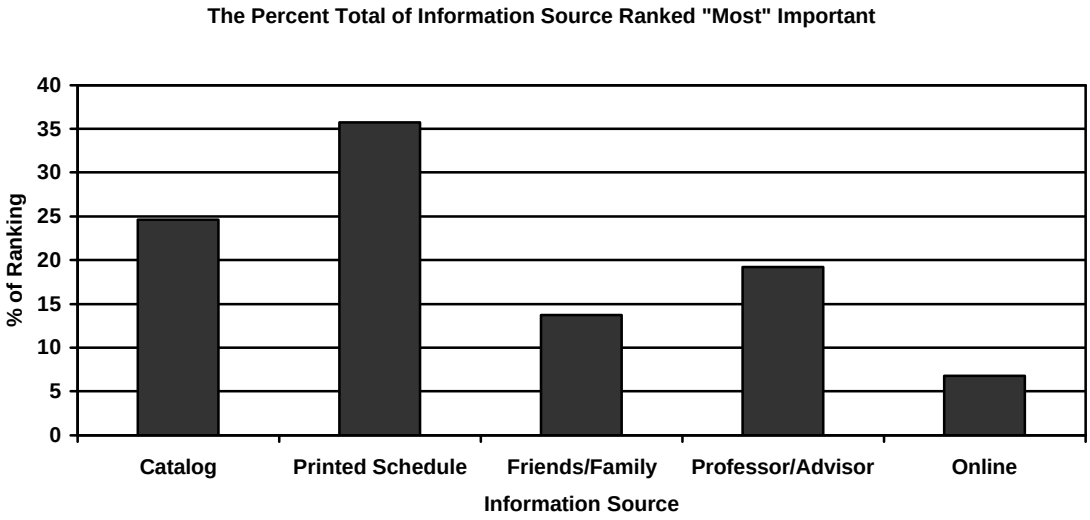


Figure 6. The percent of the total for information sources ranked most important.

The information in Table H1 regarding the role that gender plays in information source selection for this study is very important. According to the table, gender does not affect the order of importance for the various sources. Notice that the order of importance for both genders is printed schedule, printed catalog, professor/advisor, friends/family, and online schedule.

The question of why the online schedule rated so low comes to mind after evaluation of Table H1. This is the computer age and the sample population of the study skews strongly toward the younger age ranges (Figure 1). Students in those age ranges should be computer savvy and not hesitant about using the Internet. There may be several explanations. The DBU online schedule of courses is relatively new. It has only been in existence since 2001. Many students are not even aware that it is available. Those

students using it have voiced a number of complaints. There have been some complaints regarding accuracy of information. Another common complaint is that even though it provides course information, it doesn't allow for online registration. One question on the IES allowed students to explain why they didn't rate the online schedule high. The results can be seen in Table 8. Ignorance of the online schedule's existence and convenience of use of the printed schedule are the top answers.

Table 8

General Categories of Reasons for Not Using the Online Schedule

Reason	Number of responses
The printed schedule or catalog is more helpful or convenient	133
I prefer interacting with people and meeting with the Professor or Advisor	96
I didn't know about the Online Schedule	173
I don't use or have access to the Internet or there were technical problems	131
I don't like the format of the Online Schedule or I don't trust Online Schedule information	38

Note. The low numbers for the Online Schedule. Only 67 students chose it as the most important source. One question on the IES asked the respondent to write out why they didn't choose the Online Schedule as their most important source. Out of the 984 participants, 571 wrote in an answer. The answers fell into roughly these 5 categories.

Statistical significance of the choices made by gender is represented by the chi-square values in Table F1. In this case, at the .05 level, a relationship does exist between

gender and information source. Gender has an effect on the selection and ranking process.

Another frequency table is Table H2, in which U.S. citizens and non U.S. Citizens rank the information sources. Notice that the order of importance for U.S. citizens is printed schedule, catalog, professor/advisor, friends/family, and online schedule, the same as for both genders. The order is slightly different for non-citizens, with friends/family ranking more important than professor/advisor. This is surprising because international students are required by DBU administration to use the services of an advisor when creating class schedules. It may be a function of the large role played by the family in the educational process of international students.

Statistical significance of the choices made by citizen or non-citizen is represented by the chi-square values in Table F2. In this case, at the .05 level, a relationship does exist between citizenship and information source. Citizenship has an effect on the selection and ranking process.

Another variable this study considered was age in relation to information source. Table H3 shows the frequency with which students in each of the age ranges rated the information sources as most important.

Some observations regarding this data are worthy of a few remarks. In the 16-20 age range, the small number of students ranking the online as a most important source is surprising. They are part of what we may refer to as the digital or computer generation, and one would suspect that they would be more apt to use the computer as their primary source for this task. Also note that friends/family and professor/advisor play a larger role

than in the older age ranges. On the other hand, the older age ranges rank friends/family quite low in importance. It is quite probable that the younger age ranges respect the advice of friends/family who happen to be in the older age ranges. The older age ranges in turn rely heavily on professors/advisors. These professors/advisor more than likely represent the peer group for those older age ranges.

The 21-40 age range was the heaviest user of the online schedule. This age range represents years when earning potential begins to be realized. One factor affecting computer usage is the ability to afford the equipment and access costs. This may be one explanation for the increased use in this age range. Note that in the 31-40 age range it is the third most important information source. The students in this age range probably have access from work as well as home.

An examination of correlation between age range and information may best be described by the chi-square table, Table F3. In this case, at the .05 level, a relationship does exist between age range and information source. Age range has a continuing effect on the selection and ranking process.

Consideration must also be given to the role of major, as declared by the students in the study, and the ranking of most important for information sources. Table H4 shows how students in each major ranked the importance of each information source.

Of particular note in Table H4 is the large number of business majors who ranked the online schedule as most important. Table 9 shows that a majority of the business majors are also in the age ranges most likely to use the online schedule, as mentioned above in relation to Table H3. Also note that the Liberal Arts majors ranked the catalog

and the printed schedule very closely as well as friends/family and professor/advisor. The categories are not as clearly delineated as in the other majors.

Another noteworthy ranking is seen in Fine Arts and Science. In both cases professor/advisor had the second highest number of students ranking that source as the most important. It may have something to do with the nature of the work in those fields. Fine arts majors seem to rely more heavily on their professors as mentors than do those students in other majors. Science majors, especially those in pre-medical studies, have a tendency to rely upon advisors to help prepare them for entrance exams and interviews for entrance into medical schools.

Table 9

Frequency of Students in the Study by Age Range for Each Major

Age Range	Business	Fine Arts	Liberal Arts	Science	Other
16 – 20	100	41	40	64	188
21 – 30	180	22	33	33	90
31 – 40	63	5	9	14	20
41 – 50	43	1	5	2	15
50 and over	7	0	4	1	4

An examination of correlation between major and information may best be described by the following chi-square calculations in Table F4. In this case, at the .05 level, a relationship does exist between major and information source. Major has an effect on the selection and ranking process.

A last demographic variable to be considered is that of class standing and how students in each class ranked information sources. Table H5 shows how students in each class ranked the importance of each information source.

Some patterns of frequency in Table H5 deserve mention. Freshmen ranked the catalog as most important source more often than any other source. The catalog probably ranks high in the order because it provides a listing of pre-requisite courses and a sample degree plan for each major. Students refer to it to determine which courses to take next in the requisite order. At some universities the catalog is referred to as the Bulletin. It is a type of undergraduate handbook that provides a good overall picture for the student of what coursework is required and in what order it is required. For freshmen trying to determine a major, this book becomes quite valuable as a guide.

Professor/advisor received the next highest number of most important rankings among freshmen. This may well be a result of a DBU policy that allows freshmen to enroll early for classes if they consult with an advisor. DBU has two types of advisors. Some people have the job title of Advisor. The only function of the Advisor is to advise students, especially freshmen, when they prepare their class schedules for a semester. The other advisors are full-time faculty who advise those students majoring in their department.

The sophomore and junior classes show a familiar pattern of printed schedule receiving the largest number of most important rankings followed by catalog, professor/advisor, friends/family, and online, in that order.

The senior class had by far the largest number of students giving the online schedule a most important ranking. Table 10 may provide some clues as to how that occurred. The age range of most seniors is 21 and over. This represents years when earning potential begins to be realized. One factor affecting computer usage is the ability to afford the equipment and access costs. This may be one explanation for the increased use in this age range and class. The students in this class probably have access from work as well as home. Another factor may the familiarity of the seniors with the DBU system. They may have been more informed about the availability of the online schedule than those with lower class standings. In Table 8 ignorance of the existence of the online schedule is listed as a predominant reason for not using it.

Table 10

Frequency of Class Standing by Age Range

Age Range	Freshman	Sophomore	Junior	Senior
16 – 20	299	81	42	11
21 – 30	24	59	107	168
31 – 40	9	11	32	59
41 – 50	3	8	22	33
51 and over	1	0	3	12

An examination of correlation between major and information may best be described by the chi-square calculations in Table F5. Statistical significance of the choices made by students in each class is represented by the chi-square values in Table

F5. In this case, at the .05 level, a relationship does exist between class and information source. Class has an effect on the selection and ranking process.

The Effect of MBTI Type on Information Source Selection

One of the specific questions this research proposes to answer is "What relationship, if any, exists between personality type and information source selection?" The independent variable is personality trait as measured by the MBTI. One of the dependent variables is information source chosen by the user. One hypothesis is that a statistically significant correlation exists between personality type as measured by the MBTI and the information source selected during an information retrieval task. In order to answer that question and test the hypothesis, a number of statistics were run. The first is a frequency table, Table H6, which provides a view of how frequently an MBTI type ranked an information source as most important. Note in Table H6 that the most prevalent personality types had the largest number of students in that type ranking the printed schedule as most important. Those types are ENFJ, ENTJ, ENTP, ENFP, ESFJ, INFJ, INFP, INTP, ISFJ, ISFP, ISTJ, and ISTP. Even those who did not have a majority of students ranking the printed schedule as most important had it as the second most frequently and most important ranked source, with the exception of ESFP which chose catalog for second place. All of those MBTI types fit a pattern of ranking which is becoming quite familiar by now. Some interesting frequencies in Table H6 are worthy of note. The MBTI type ENTJ had the same number of students choosing catalog as the most important source as those choosing printed schedule as the most important source. According to Table 7, most of the ENTJ is represented by freshmen. One MBTI type,

ESTJ, had more students choosing catalog as the most important source. The second largest group represented in ESTJ is freshmen (Table 7). Freshmen ranked the catalog as the most important source more often than any other source according to Table H5. The catalog probably ranks so high in the order because it provides a listing of pre-requisite courses and a sample degree plan for each major. Students refer to it to determine which courses to take next in the requisite order. At some universities the catalog is referred to as the Bulletin. It is a type of undergraduate handbook that provides a good overall picture for the student of what coursework is required and in what order it is required. For freshmen trying to determine a major, this book becomes quite valuable as a guide.

Another interesting finding in Table H6 is that more students in the MBTI type ESFP ranked friends/family as the most important information source than any other source. The demographics of ESFP in this study are majority female (Table 3), majority freshmen (Table 7), with a majority in the 16-20 age range (Table 4). Two characteristics of this MBTI type may explain the preference for friends/family. This type likes to work with others to achieve goals. They tend to be "people persons." They also look to authority figures for guidance. Since most of them have just left home where the authority figure is a parent, they may still enjoy the guidance from and group work with their parent or parents. If the authority figure/parent theory is correct, then one would expect that professor/advisor would also rank quite high for this group. That is not the case, though. Future research into this finding may give a clearer picture.

One MBTI type that did rank professor/advisor as the most chosen information source was ESTP. The demographics for this type in the study are the same as for the

ESFP discussed earlier. The ESTP types also enjoy collaboration on tasks and are dependent learners, relying on example from authority figures. It is quite interesting that ESFP and ESTP both chose human sources over other sources as most important to them. Except for the FT dichotomy, both types share many common traits, one of which is an outgoing personality and need to be around people.

A last observation from Table H6 is the large number of students (26) in this study from the MBTI type INTJ who chose the online schedule as the most important information source. The demographics for this type in the study are majority female (Table 3), majority seniors (Table 7), a majority major in business (Table 6), and a majority are in the 21-30 age range (Table 4). The 26 students who chose the online schedule as the most important information source represent 38.9% of all the students in the study who ranked the online schedule high. There may be several reasons for such large numbers from one type. One reason may hinge on the fact that most of the INTJ type students in the study have declared business as a major. The largest department in the College of Business at DBU is Management Information Systems (MIS). This department specializes in the use of computer technology in business. Students working in MIS might be more apt to use online schedules. Another reason may be that most of the INTJ students in the study are seniors. The senior class had by far the largest number of students (43) giving the online schedule a most important ranking. Table 10 may provide some clues as to how that occurred. The age range of most seniors and most students with the INTJ type is 21 and over. This represents years when earning potential begins to be realized. One factor affecting computer usage is the ability to afford the

equipment and access costs. This may be one explanation for the increased use in this age range and class. The students in this class probably have access from work as well as home. Another factor may the familiarity of the seniors with the DBU system. They may have been more informed about the availability of the online schedule than those with lower class standings. In Table 8 ignorance of the existence of the online schedule is listed as a predominant reason for not using it. A final consideration is the traits associated with the INTJ personality type. INTJ's are heavily represented in the fields of education, science and technology, and computing because of those traits. The INTJ student would be more likely to use the online schedule because of an affinity of that personality type toward the use of computers.

Statistical Measures of MBTI Against Information Source

An examination of correlation between MBTI and information source may best be described by the following chi-square calculations in Table F6 for Extraversion types and Table F7 for Introversion types. Statistical significance of the choices made by students in each MBTI type is represented by the chi-square values in Tables F6 and F7. In this case, at the .05 level, a relationship does exist between 13 of the 16 MBTI types and information source. MBTI type has an effect on the selection and ranking process of information sources for those 13 types. Note that ESTJ, ESFP, ESTP, and INTJ, the types which represented different choices from the rest in their selection of the most important information source, have the same result.

Another statistical measurement is ANOVA. It can be argued that ANOVA has little value when dealing with nominal and ordinal data. Yet the values for this study of information source against MBTI type are intriguing. Table G1 shows the results.

In the ANOVA test, if the *F* ratio is small, then the main effects are due to random sampling error. The ANOVA test in this case shows significant *F* ratios. The larger the *F* ratio, the greater the chance that the statistical hypothesis will be rejected. That hypothesis states that all the population means are equal. Therefore, in this case, at the .05 level, a relationship does exist between MBTI type and information source. MBTI type has an effect on the selection and ranking process.

Relevance Criteria Statistics

Students who participated in the study were asked to rank information sources in order of importance from "Most" important to "Least" important. Next the students were asked to rate the relevance criteria they used to select the information source they chose as most important. There were 25 relevance criteria. Using a 5-point Likert scale they rated the criteria in levels of importance for their task of information source selection. The levels were "extremely," "very," "important," "somewhat," and "not at all."

One of the specific questions this research proposed to answer is: "What relationship, if any, exists between personality type and relevance criteria?" The independent variable is personality trait as measured by the MBTI. One of the dependent variables is relevance as rated by the user. One hypothesis is that a statistically significant correlation exists between personality type as measured by the MBTI and the relevance criteria used during an information source selection task. In order to answer that question

and test the hypothesis, a number of statistics were run. The first are a number of frequency charts showing the relationship of the study demographics with relevance criteria. The first figures, I1 and I2, show the frequency with which male and female students rated each relevance criteria as extremely important.

Relevance criteria are used within a context. In this study the context is the selection of an information source for an IR task. This frequency and all frequencies in the following charts will reveal which criteria were of extreme importance when choosing the information source ranked most highly by each group. For males the information source selected most often as most important was the printed schedule. The relevance criteria deemed extremely important by the male students were about the topic, easy to use, current, credible, accurate, understandable, and consistent. Other criteria that seem to be ranked a bit higher than the others were: I like it, interesting, and enjoyable. When looking at the female response in Figure I2, a similar pattern occurs. For females, just as with the males, the information source selected most often as most important was the printed schedule. Even though the pattern is similar, some differences must be pointed out. In addition to selecting the same criteria mentioned as extremely important for the males, the females rated as extremely important the criteria of comprehensive, detailed, reputable, and provides examples.

This may point out some differences between genders that may have implications for further studies. Yet, there may be statistical significance for the gender use of these criteria. Note the chi-square Table F8. In this case, at the .05 level, a relationship does

exist between gender and relevance criteria. Gender has an effect on the rating of relevance criteria.

Citizenship must also be considered. Figures I3 and I4 show the relevance criteria rated extremely important by U.S. citizens and non-U.S. citizens. The information source rated most important for each group was the printed schedule. The relevance criteria of unique, new, and prominent are rated low for those with U.S. citizenship. For those who are not U.S. citizens, the similarities extend even to those criteria rated low. In addition, they also rate the criteria of reputable and validates my viewpoint as low. When considering the issue of citizenship, it is always advisable to remember that the English language skills of the international students may not be of the same proficiency throughout the sample population. This may affect the way that the survey questions are answered.

There is statistical significance for the citizenship use of these criteria. Note the chi-square Table F9. In this case, at the .05 level, a relationship does exist between citizenship and relevance criteria. Citizenship has an effect on the rating of relevance criteria.

Another demographic variable for consideration is the age range of the students and the affect that it may have on the rating of relevance criteria. There are five age ranges: 16–20, 21–30, 31–40, 41–50, and 50 and over. The Figures I5 to I9 provide the frequencies for which each age range rated the relevance criteria. A frequency table is provided for each of the age ranges. For all of the age ranges, the information source

chosen as most important was the printed schedule. In the case of the age range 50 and over, the printed schedule tied with the catalog as the most important information source.

Every age range rated the criterion “easy to use” quite high. The convenience of being able to take a printed schedule anywhere and the ability to mark on it seem to be part of its appeal. Also, every age range ranked the criteria “comprehensive” and “detailed” high. In the age ranges 40–51 and 51 and older, Figures I8 and I9, the criterion “accuracy” is rated lower than in the other age ranges. Yet, each of them rate “comprehensive” and “detailed” high.

There is statistical significance for age ranges and their use of these criteria. Note chi-square Table F10. In this case, at the .05 level, a relationship does exist between age and relevance criteria. Age has an effect on the rating of relevance criteria.

The demographic variable of major and the affect that may have on the rating of relevance criteria must be considered. There are five majors: Business, Fine Arts, Liberal Arts, Science, and Other. Figures I10 to I14 provide the frequencies for which each major rated the relevance criteria. A frequency table is provided for each of the majors. For all of the majors, the information source chosen as most important was the printed schedule.

There is statistical significance for age ranges and their use of these criteria. Note chi-square table F11. In this case, at the .05 level, a relationship does exist between major and relevance criteria. Major has an effect on the rating of relevance criteria.

A final demographic variable, that of class standing, and the affect that may have on the rating of relevance criteria must be considered. There are four classes: Freshman, Sophomore, Junior, and Senior. Figures I15 to I18 provide the frequencies for which each

class rated the relevance criteria. A frequency table is provided for each of the classes. The freshman class ranked the catalog as the most important information source. For all of the other classes the information source chosen as most important was the printed schedule.

There is statistical significance for class standing of these criteria. Note the chi-square table F12. In this case, at the .05 level, a relationship does exist between class standing and relevance criteria. Class standing has an effect on the rating of relevance criteria.

The Effect of Information Source on Relevance Criteria Rating

The relevance criteria are directly related to the information source chosen as the most important. The students were specifically instructed to focus on the information source they had chosen as the most important. The following charts reflect the frequency with which a relevance criterion was rated as extremely important for an information source that was ranked most important.

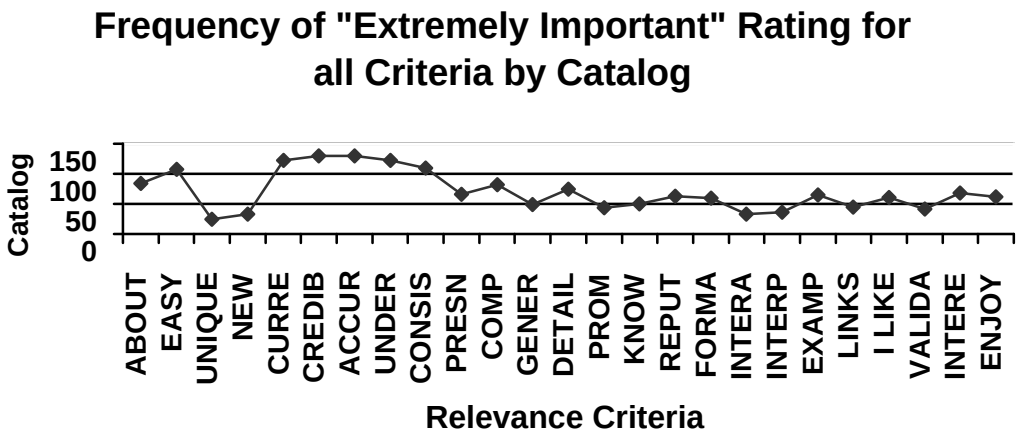


Figure 7.

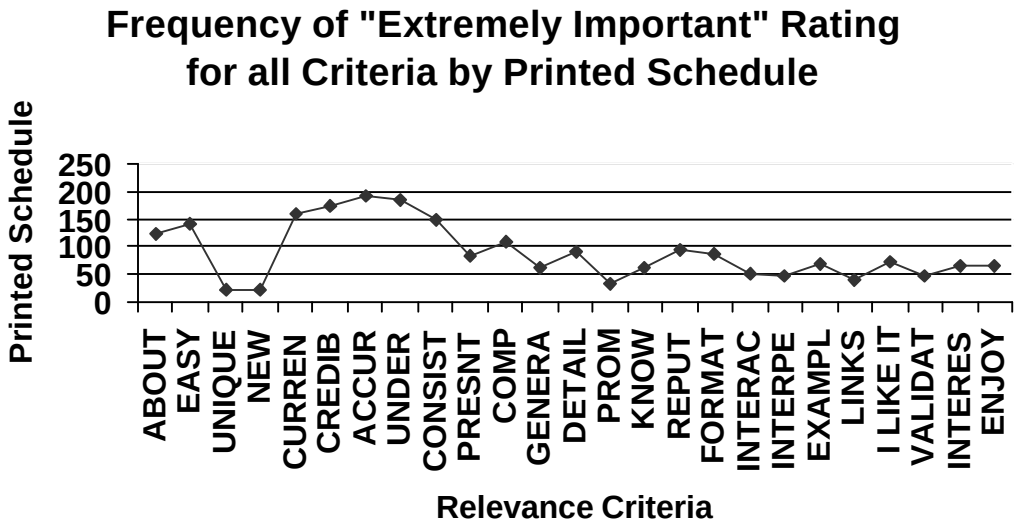


Figure 8.

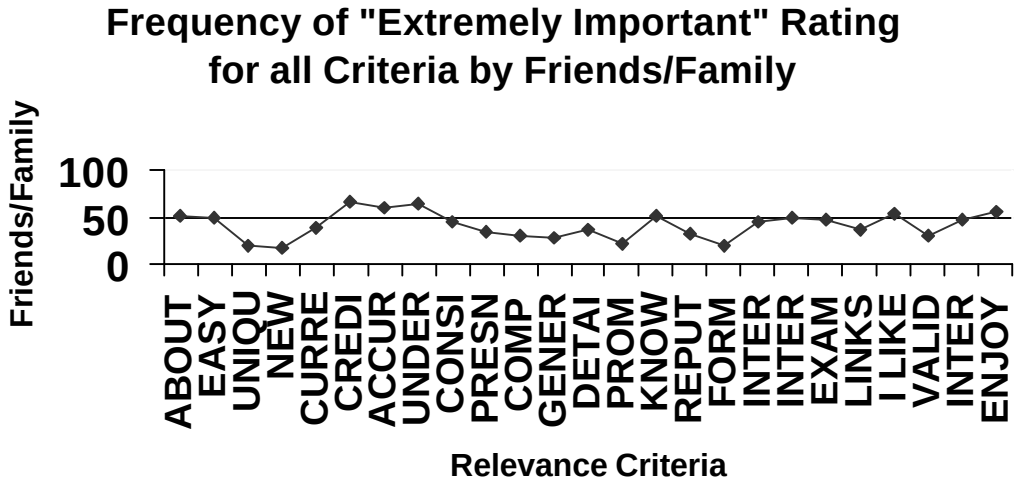


Figure 9.

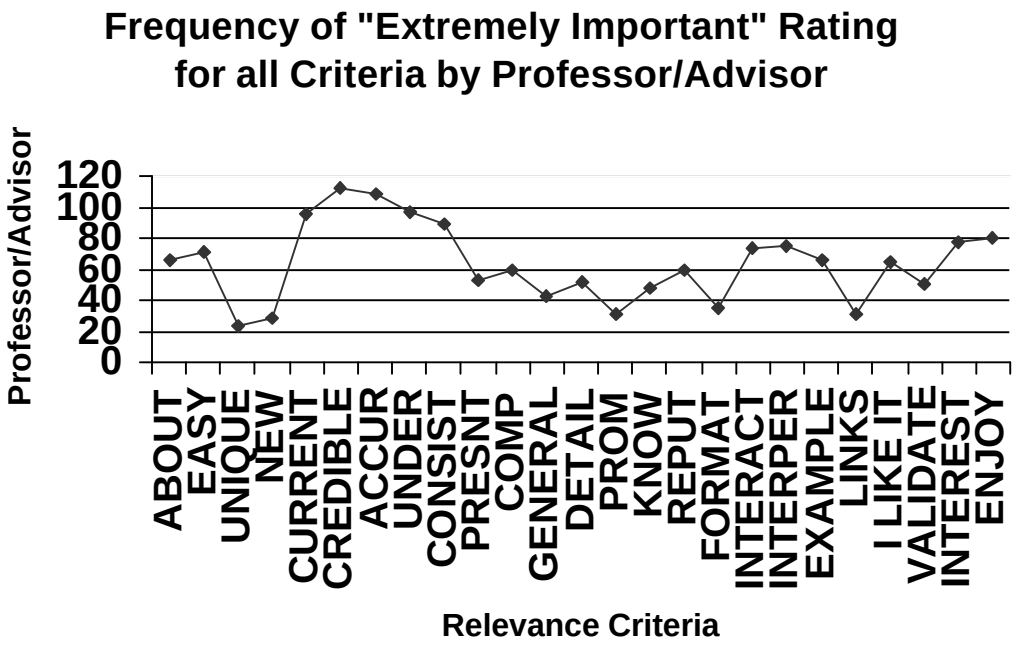


Figure 10.

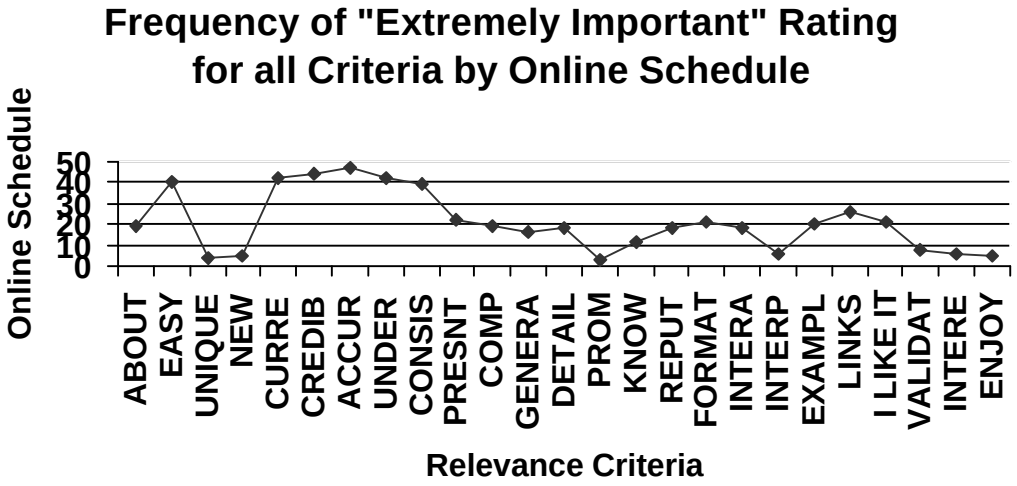


Figure 11.

The Effect of MBTI Type on Relevance Criteria Rating

One of the specific questions this research proposes to answer is: "What relationship, if any, exists between personality type and the use of relevance criteria?" The independent variable is personality trait as measured by the MBTI. The Myers-Briggs Type Indicator is both a copyrighted term and a commonly used inventory of personality types. There are sixteen distinct personality types as defined by the MBTI.

One of the dependent variables is relevance criteria used to select the information source chosen by the user. There are 25 distinct relevance criteria used for this study. One hypothesis is that a statistically significant correlation exists between personality type as measured by the MBTI and the relevance criteria used to select the information source for an information retrieval task. In order to answer that question and test the hypothesis a number of statistics were run. The first is a series of figures that provides a view of how frequently an MBTI type rated a relevance criterion as extremely important. The Figures J1 to J16 show the frequency with which each personality type rated each relevance criterion as extremely important. As seen in Table F13, at the .05 level, a relationship does exist between MBTI type and relevance criteria. MBTI type has an effect on the rating of relevance criteria.

Another statistical measurement is ANOVA. It can be argued that ANOVA has little value when dealing with nominal and ordinal data. Yet the values for this study of relevance criteria against MBTI type are intriguing. Table G2 shows the results.

In the ANOVA test, if the F ratio is small, then the main effects are due to random sampling error. The ANOVA test in this case shows significant F ratios. In this case, at

the .05 level, a relationship does exist between MBTI type and relevance criteria. MBTI type has an effect on the rating process. Figures K1 to K25 show the mean values of the MBTI against each relevance criterion for the sample population. It is worth noting that there are variances among the mean values for the MBTI type against each relevance criterion. This becomes important because ANOVA is concerned with variances among the sample population.

The Intersection of MBTI Type, Information Source, and Relevance Criteria

Statistically it has been shown that MBTI type has an effect on both information source selection and relevance criteria used to make that selection. Is there an intersection between all three? I created a series of relationship studies involving Venn diagrams, as seen in Figures L1 to L16. This study recognizes that relevance criteria represent the factors that are important for the students when they select an information source. Relevance criteria also represent the intersection between MBTI type and information source. Figures 25 to 29 show the frequency with which all of the relevance criteria are rated “extremely important” for each of the information sources. Figures J1 to J16 show the same frequencies for each MBTI type. The Venn diagrams show the intersection of the top six relevance criteria ranked extremely important for each MBTI type with the top six relevance criteria ranked “extremely important” for each information source. The top six relevance criteria represent approximately the top 25% of all criteria. The intersections are quite obvious when viewing the Venn diagrams.

CHAPTER V

Conclusions

Many studies regarding information source selection in an IR environment have been conducted. There is also a growing body of research regarding relevance criteria as indicators of reasons underlying source choice. Internal personal factors affecting the use of relevance criteria and the selection of information sources have been the object of some conjecture in Information Science. The internal psychological factor of personality type has been heavily researched in a number of disciplines. In Information Science, if internal psychological factors such as personality type affect information-seeking behavior, then they must be taken into account when designing information systems and services. Ignoring internal factors may impede use, acceptance, and effectiveness of any IR technology. Understanding the relationship between specific internal factors to relevance criteria use and information source selection is a start toward building for the future of information provision.

This chapter summarizes the study's purpose, design, and results; presents conclusions for hypothesis 1 and hypothesis 2; acknowledges limitations of the study; describes potential applications of results; and discusses contributions of the study to the field and future research directions.

Summary of the Study

The purpose of this study was to determine (a) whether a significant correlation exists between personality type and information source chosen for a particular task and (b) whether a significant correlation exists between personality type and the use of relevance criteria for selecting the information source.

The study focused on a common task that millions of undergraduate students at every university must complete every semester: deciding which courses and sections to take in the next semester. During the registration period, students were asked to complete the Information Evaluation Survey (IES) developed by the researcher. This instrument allowed them to rank the relative importance of five information sources they could have used to complete the task. The five sources were: (a) the printed catalog, (b) printed schedule, (c) friends and family, (d) professors and advisors, and (e) online schedule. For the information source they ranked highest, students rated each of 25 relevance criteria they could have used to select that source. The criteria were rated on a five-point scale from extremely important to not at all important.

Students were then asked to complete the standardized Myers-Briggs Type Indicator (MBTI) in order to determine their personality type. The MBTI is heavily used and quite popular; many people have heard of it and enjoy taking it. Availability, ease of use, and acceptance by students made the MBTI an ideal instrument for this study.

Data were collected at Dallas Baptist University (DBU) during three semesters: fall 2001, winter 2001-2002, and spring 2002. The students were selected as randomly as possible, representing a good cross section of the DBU undergraduate population.

Usable responses from 984 students were collected. The data were analyzed with frequency tables and charts, chi-square, ANOVA, and Venn diagrams. The results showed that, overall, personality type is a statistically significant factor related to information source selection and the relevance criteria used to select sources.

Hypothesis 1 Results

Research question 1 asks: What relationship, if any, exists between personality type and information source selection? Hypothesis 1 states: A statistically significant correlation exists between personality type as measured by the MBTI and the information source selected during an information retrieval task. The independent variable is personality trait as measured by the MBTI. One of the dependent variables is information source chosen by the user.

This study found a correlation between MBTI and information source. The relationship can be shown and evaluated in a number of ways. Statistical significance of the choices made by students in each MBTI type group is represented by the chi-square values in Tables F6 and F7. In this case, at the .05 level, a relationship does exist between 13 of the 16 MBTI types and information source. MBTI type has an effect on the selection and ranking process of information sources for those 13 types. Note that ESTJ, ESFP, ESTP, and INTJ, the types that represented different choices from the rest of the types in their selection of the most important information source, still reject the null hypothesis.

Another statistical measurement is ANOVA. Table G1 shows the results. In the ANOVA test if the F ratio is small, then the main effects are due to random sampling

error. The ANOVA test in this case shows significant F ratios. Therefore, in this case, at the .05 level, a relationship does exist between MBTI type and information source. MBTI type is significantly related to the selection and ranking of information sources.

One example would be the MBTI type, ESTJ, that had more students who choose catalog as the most important source. The second largest group represented in ESTJ is freshmen (Table 8). Freshmen ranked the catalog as most important source more often than any other source according to Table H5. The catalog probably ranks high in the order because it provides a listing of prerequisite courses and a sample degree plan for each major. Students refer to it to determine which courses to take next in the requisite order. For freshmen trying to determine a major, this book is quite valuable as a guide.

Another example of extraneous variables is the large number of students (26) from the MBTI type INTJ who chose the online schedule as the most important information source. In this study, the demographics for the type are majority female (Table 3), seniors (Table 7), business majors (Table 6), and ages 21 to 30 (Table 4). The 26 students who chose the online schedule as the most important information source represent 38.9% of all the students in the study who ranked the online schedule high. There may be several reasons for such large numbers from one personality type. One reason may hinge on the fact that most of the INTJ-type students in the study have declared business as a major. The largest department in the College of Business at DBU is Managing Information Systems (MIS). This department specializes in the use of computer technology in business. Students working in MIS might be more apt to use online schedules. Another reason may be that most of the INTJ students in the study are

seniors. The senior class had by far the largest number of students (43), giving the online schedule a most important ranking. Table 10 may provide some clues as to how that occurred. The age range of most seniors and most students with the INTJ type is 21 and over. This represents years when earning potential begins to be realized. One factor affecting computer usage is the ability to afford the equipment and access costs. This may be one explanation for the increased use in this age range and class. The students in this class probably have access from work as well as home. Another factor may be the familiarity of the seniors with the DBU system. They may have been more informed about the availability of the online schedule than those with lower class standings. Table 10 lists ignorance of the existence of the online schedule as a predominant reason for not using it. An important consideration is the traits associated with the INTJ personality type. INTJ's are heavily represented in the fields of education, science and technology, and computing because of those traits. The INTJ student would be more likely to use the online schedule because of an affinity of that personality type toward the use of computers.

Hypothesis 2 Results

Research question 2 asks: What relationship, if any, exists between personality type and relevance criteria used to select an information source? Hypothesis 2 states: A statistically significant correlation exists between personality type as measured by the MBTI and the use of specific relevance criteria for selecting an information source during an information retrieval task. The independent variable is personality type as measured by the MBTI. The MBTI identifies 16 personality types. One of the dependent variables

in this study is relevance criteria used to select the information source chosen by the user. The IES identifies 25 relevance criteria.

This study found strong correlations in chi-square tests between MBTI and relevance criteria. Statistical significance of the choices made by students in each MBTI type is represented by the chi-square values in Table F13. In this case, at the .05 level, a relationship does exist between MBTI type and relevance criteria. MBTI type has a correlation to the rating process of relevance criteria.

A second statistical measurement is ANOVA. The values for this study of relevance criteria against MBTI type are significant. Table G2 shows the results. In the ANOVA test if the F ratio is small, then the main effects are due to random sampling error. The ANOVA test in this case shows significant F ratios. Therefore, at the .05 level, a relationship does exist between MBTI type and relevance criteria. MBTI type has a correlation to the rating process of relevance criteria. Frequency charts, Figures J1 to J16 also clearly show this significance.

A third series of relationship studies involves Venn diagrams, seen in Figures L1 to L16. This study recognizes that relevance criteria represent the factors that are important for the students when they select an information source. Relevance criteria also represent the intersection between MBTI type and information source. Figures 7 through 11 show the frequency with which all of the relevance criteria are rated extremely important for each of the information sources. Figures J1 to J16 show the same frequencies for each MBTI type. The Venn diagrams show the interaction of the top six relevance criteria ranked extremely important for each MBTI type with the top six

relevance criteria ranked extremely important for each information source. The top six relevance criteria represent approximately the top 25% of all criteria. The overlaps are quite obvious when viewing the Venn diagrams. Another way of looking at the interactions is depicted in Figure 12.

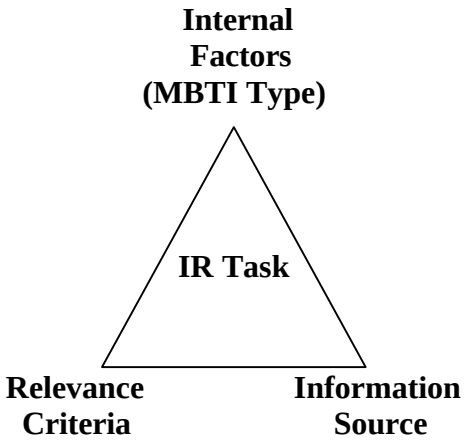


Figure 12.

MBTI type suggests the use of relevance criteria that, in turn, are used to select the information source. Another way of expressing the concept is that people with different personality types view their world in different ways. Every information-gathering task is approached within that world view. The information required to fulfill the task varies depending upon the way that personality type perceives the nature of that task. Personality becomes a catalyst for using relevance criteria to choose a specific information source. Therefore, the IR task must be taken into account. The nature of the task influences the relevance criteria rated extremely important that, in turn, influence the information source. Obviously, a different set of information sources would be required for the IR task of gathering information concerning the purchase of an automobile than

for the organizing of a semester schedule, and the relevance criteria would be employed differently. Yet, even in that task, MBTI type would likely have an effect on the information source and relevance criteria.

Limitations of the Study

Can these results be generalized to the whole population of university undergraduates? Some factors may seem to mitigate the generalization of the results. Of particular concern are some of the idiosyncrasies of the DBU registration process. International students are not allowed to register online, but must consult with an advisor. Newly recruited freshmen are allowed to preregister for courses if they consult with an advisor. Another concern may be the overrepresentation of certain personality types. Some of the MBTI types are known to be attracted to and persist well at private church-related colleges and universities. Yet, this may be true of many other personalities with regard to public universities and should not weaken the results. I believe that a relationship between MBTI type and relevance criteria and information source exists regardless of academic setting and task.

Applications of Results

One example of application from positive results of this study may be at universities. A problem common to all institutes of higher learning is retention of students both during the semester and until completion of a degree. Of course, if the problem is one of family strife, job relocation, finances, low intelligence, or health the results of this study may not help much. But all too often the problems of dropping classes or not returning to the university result from poor or non-existing advising of the

student. In many cases the wrong advising tool is employed. It is possible that some students may need to speak with an academic advisor because their personality type makes them more comfortable with that approach. It may be that some students prefer the portability of the printed schedule or catalog so that they can examine their choices at leisure while doing laundry or while stuck in a traffic jam. They may not even have access to the Internet or computing tools. Still others may be more comfortable with an online schedule on the Internet, preferring the quick approach that does not require that they be on campus at a particular time. If the students themselves and the university department advisors are aware of each student's needs and preferences, it may be possible to improve advising. This can lead to a more stable and comfortable situation for the student that, in turn, may enhance the probability of the student's return to the same university semester after semester. Satisfied students are also good recruiters for a university.

Another application is in the area of distance education. Certain students may have a better chance for succeeding at distance education courses because of personality type. White (2000) states that others may struggle because they need more human interaction. This research provides insights into why people value certain information sources over others. Therefore, it may provide the framework for advising students in their choice of distance versus traditional educational modes, or even a hybrid (distance course with some time in a traditional classroom) approach. Some students can participate in distance education if they have a healthy dose of human contact to augment the experience. They would benefit from such a hybrid approach.

In the broader environment of the Internet, producers and marketers of information would be particularly interested in knowing of correlations between relevance criteria and psychological type. Kannan, Chang, and Whinston (1998) propose that when members join any online community they provide information on demographics and psychographics at the time of enrollment. They propose a model of marketing that places weighted values on demographics/psychographics, transaction information, attitudes and beliefs, and interaction dynamics with other members. In the article they mention the Firefly Network. Firefly has created online communities of like-minded people by employing a unique filtering engine. Although this sounds interesting, it could also be boring or one-dimensional. What if, through a better understanding of the dynamics of psychological type and relevance criteria, Firefly's engine could point members toward topic or people they may have overlooked because of internal (psychological type/relevance criteria) bias? The experience for the user would be much richer.

Contributions to the Field

This study makes at least four contributions to knowledge in information science. First, the results contribute to understanding in an area of internal human factors, personality type, that has not been studied with regard to information-seeking behavior. The finding of strong correlations between personality type and information source selection and between personality type and the use of relevance criteria to select sources, underscore the importance of pursuing research in this area.

Second, the study extends the range of a standardized and widely applied instrument, the MBTI, to investigate the influence of personality type on human interactions with nonhuman sources: print and electronic documents. The definitions of MBTI personality types are geared toward interpersonal communication behaviors.

Third, the findings expand on and confirm past research that showed relevance criteria to be applied by users regardless of the type of information task or problem situation. This study focused on a type of information task situation, students deciding which courses to take, which previously had not been studied.

Fourth, the study tested and helped to validate a version of a relevance criteria instrument. The IES was a refinement of earlier instruments listing criteria originally derived directly from users. Like its predecessors, the IES yielded highly useful semantic differential data.

Future Research

The findings of this study and potential applications of results suggest several possible research directions. Although the results provide evidence of relationships between MBTI type, relevance criteria, and information systems, they do not establish the strength of that relationship. It may be possible to create a metric system for just such a study.

Other internal factors should be studied to see whether they are related to relevance criteria use and information source selection. Examples are culture and other social factors and intelligence.

This study could become a longitudinal study carried out over a period of years to determine whether the results hold true for this university (DBU) over time. Replication of this study at a public university might establish conclusively whether the results of this study can be generalized to the population at large.

The results of this study demonstrate that personality type is strongly correlated with information source selection and the use of relevance criteria to select sources. Further research on personality type and other internal human factors can contribute to a better understanding of information-seeking behavior and to the development of more effective techniques for IR and delivery.

APPENDIX A

UNT IRB Approval Letter and Information Form

UNIVERSITY of NORTH TEXAS

Office of Research Services

June 29, 2001

Dale B. Sims
4229 Briar Hill Dr.
Grand Prairie, TX 75052

RE: Human Subjects Application No. 01-134

Dear Mr. Sims,

Your proposal titled "A Study of the Effect of Personality Type on the Use of Relevance Criteria for Purposes of Selecting Information Sources" has been approved by the Institutional Review Board and is exempt from further review under 45 CFR 46.101.

Enclosed is the consent document with stamped IRB approval. Please copy and **use this form only** for your study subjects.

The UNT IRB must review any modification you make in the approved project. **Federal policy 21 CFR 56.109(e) stipulates that IRB approval is for one year only.**

Please contact me if you wish to make changes or need additional information.

Sincerely,

Peter L. Shillingsburg
Chair
Institutional Review Board

PS:sb

P.O. Box 305250 • Denton, Texas 76203-5250 • (940) 565-3940
Fax (940) 565-4277 • TDD (800) 735-2989 • www.unt.edu

INFORMATION FORM

Students must make certain decisions during the semester registration process. One thing to decide is what information source to use for figuring out the next semester schedule. Students use certain criteria to choose information sources. This research will be a study of this process and it is hoped that the information gained will help researchers understand the underlying cognitive processes which are used during the decision making process. This information may then be used to help people make better decisions through the use of various training techniques or the creation of effective automated systems.

Please note that you do not have to participate in this study, and once you begin with the surveys, you can change your mind and decide not to participate. There is no penalty for not participating. However, your participation is much appreciated. I want you to understand that everything you do and every answer you give will be held confidential at all times. Do not put your name or any identifying marks on any of the material that you will be using. You should also know that this research is my doctoral work and is not associated with official work at Dallas Baptist University. This work is conducted under the supervision of the College of Library and Information Sciences, Department of Information Sciences, at the University of North Texas in Denton, Texas. Dr. Linda Schamber is the Chair of the dissertation committee. She can be contacted at 940-565-2445 or by e-mail at schamber@unt.edu. This study is approved by the UNT Committee for the Protection of Human Subjects. The phone number for the committee is 940-565-3940. You may keep this form for future reference.

If you have chosen to participate, please look at the papers on the table in front of you. You should have two surveys in front of you. One survey, the Myers-Briggs Type Indicator (MBTI), has a booklet associated with it. Do not write in the booklet. Turn the MBTI survey form over to find where to answer for parts 1, 2, and 3. Answer all 126 questions in the booklet by filling in the correct answer on the bubble sheet. The other survey, the Information Evaluation Survey, can be filled out by writing or circling the correct answer.

During the testing you may ask questions. I cannot tell you what to answer, but I can clear up any misunderstanding that you may have or give definitions of terms used on the question sheet. Take your time in answering questions. Hopefully, this won't take long and you can be on your way.
When you are finished lay down your pencil and turn the two sheets over face-down on the table. Then you are free to leave.

If you have any questions or problems that arise in connection with your participation in this study, you should contact Dale B. Sims, College of Business, Dallas Baptist University, Dallas, Texas at (214) 333 – 5249.

Your cooperation with this study is greatly appreciated.

Dale B. Sims

APPROVED BY THE UNT IRB
FROM 6/29/01 TO 6/28/02

APPENDIX B

Information Evaluation Survey (IES) and Key

IES Key

Information Source

University Catalog – Sometimes referred to as the Bulletin. It contains information about the university and each of its programs.

Printed Schedule – The schedule of courses being offered for each semester.

Friends/Family – Any family member, either nuclear or extended family. Also, any person regarded as a friend or peer to whom one would go for advice.

Professor/Advisor – At DBU one of the roles of a professor is to be an advisor for students. There are also full-time staff people with the title of "Advisor" who do not teach.

Online Schedule – DBU has a semester schedule that is posted on the DBU web site.

Relevance Criteria

The students were asked to rate relevance criteria that they used to select the most important information source. The personal pronouns "my" and "mine" were implied in this context. The users were to ask themselves the question of "why" the information source was chosen most important and to what extent did that "why" influence the decision. The following criteria have come from previous studies of users of information sources. Those users declared the following criteria to be of value when selecting sources similar to those used in this study.

About the topic – Was the information source selected most important because it was about the topic I am interested in?

Easy to obtain - Was the information source selected most important because it was convenient for me to get to or take with me?

Unique or only source – Was the information source selected most important because there is not another like it?

New source for me to use – Was the information source selected most important because I wanted to try something new and this would be a new source for me?

Current information – Was the information source selected most important because it provided the most current and up-to-date information?

Credible - Was the information source selected most important because it was the most believable source?

Accurate - Was the information source selected most important because it was the most free from error?

Understandable - Was the information source selected most important because it was easy for me to comprehend?

Consistent - Was the information source selected most important because it was free from variation and contradiction?

Presentation information - Was the information source selected most important because of the way the information was presented to me?

Comprehensive - Was the information source selected most important because it was all inclusive, covering every bit of information needed?

Suitably general or specific - Was the information source selected most important because it was either universal or particular in the way it provided information?

Detailed - Was the information source selected most important because it was thorough in its treatment of information?

Prominent - Was the information source selected most important because it was widely and popularly known?

I know the source - Was the information source selected most important because it was familiar to me?

Reputable - Was the information source selected most important because it was held in high esteem?

Format of source - Was the information source selected most important because of its shape, size, or general plan of organization?

Interactive - Was the information source selected most important because it provided mutual or reciprocal action?

Interpersonal - Was the information source selected most important because it provided contact with another person?

Provides examples - Was the information source selected most important because it provided a pattern, template, or model for me to follow?

Provides links to other sources - Was the information source selected most important because it provided a connection to another origin of information?

I like it - Was the information source selected most important because it appealed to me in some manner?

Validates my viewpoint - Was the information source selected most important because it confirms my opinion?

Interesting - Was the information source selected most important because it aroused and held my attention?

Enjoyable - Was the information source selected most important because it gave me satisfaction or pleasure to use it?

Information Evaluation Survey

Please circle the answer that is correct for you.

	A	B	C	D	E
1. Age:	16 – 20	21 – 30	31 – 40	41 – 50	51 and over

2. Gender: Male Female

3. Classification: Freshman Sophomore Junior Senior Post Graduate

4. Major: Science Business Fine Arts Liberal Arts Other

5. U.S. Citizen Yes No

Below are five sources of information. When deciding which classes to register for this semester, how important are the following sources of information? Rank them according to importance, with "**A**" being the most important and "**E**" being the least important. Please circle the relative importance of each source when compared to the other sources.

	A	B	C	D	E
7. University Catalog:	Most	2nd most	3rd most	4th most	Least
8. Printed semester schedule:	Most	2nd most	3rd most	4th most	Least
9. Friends or Family:	Most	2nd most	3rd most	4th most	Least
10. Professors/Advisors:	Most	2nd most	3rd most	4th most	Least
11. Online Schedule:	Most	2nd most	3rd most	4th most	Least

11a. If you didn't choose the Online schedule as your most important source, then explain why not.

Write your answer here_____

12. How satisfied are you with the information source you rated as the most important?

A	B	C	D	E
Extremely	very	satisfied	somewhat satisfied	not satisfied

The following questions are only concerned with the source you chose as the most important. Please focus on that source. When gathering data from that source, how important are the following criteria? Please circle the amount of importance the following criteria have for you.

Topicality

	A	B	C	D	E
13. About my topic:	Extremely	Very	Important	Somewhat	Not at all

Availability

14. Easy to obtain:	Extremely	Very	Important	Somewhat	Not at all

Novelty

15. Unique or only source:	Extremely	Very	Important	Somewhat	Not at all
16. New source for me to use:	Extremely	Very	Important	Somewhat	Not at all

Currency

17. Current information:	Extremely	Very	Important	Somewhat	Not at all

Quality of Information

18. Credible:	Extremely	Very	Important	Somewhat	Not at all
19. Accurate:	Extremely	Very	Important	Somewhat	Not at all
20. Understandable:	Extremely	Very	Important	Somewhat	Not at all
21. Consistent:	Extremely	Very	Important	Somewhat	Not at all

Presentation Characteristics

22. Presentation information:	Extremely	Very	Important	Somewhat	Not at all
23. Comprehensive:	Extremely	Very	Important	Somewhat	Not at all
24. Suitably general or specific:	Extremely	Very	Important	Somewhat	Not at all
25. Detailed:	Extremely	Very	Important	Somewhat	Not at all

The following questions are only concerned with the source you chose as the most important. Please focus on that source. When gathering data from that source, how important are the following criteria? Please circle the amount of importance the following criteria have for you.

Source Characteristics

	A	B	C	D	E
26. Prominent:	Extremely	Very	Important	Somewhat	Not at all
27. I know the source:	Extremely	Very	Important	Somewhat	Not at all
28. Reputable:	Extremely	Very	Important	Somewhat	Not at all
29. Format of source:	Extremely	Very	Important	Somewhat	Not at all
30. Interactive:	Extremely	Very	Important	Somewhat	Not at all
31. Interpersonal:	Extremely	Very	Important	Somewhat	Not at all

Information Characteristics

32. Provides Examples:	Extremely	Very	Important	Somewhat	Not at all
33. Provides links to other sources:	Extremely	Very	Important	Somewhat	Not at all

Appeal of Information

34. I like it:	Extremely	Very	Important	Somewhat	Not at all
35. Validates my viewpoint:	Extremely	Very	Important	Somewhat	Not at all
36. Interesting:	Extremely	Very	Important	Somewhat	Not at all
37. Enjoyable:	Extremely	Very	Important	Somewhat	Not at all

Thank you so very much for your help.

Professor Dale B. Sims

APPENDIX C

Myers-Briggs Type Indicator (MBTI) Key to Understanding the Personality Types

MBTI Key

The Myers-Briggs Type Indicator, which is based on Jung's theories of personality types, is used to explain some differences in cognitive styles. It identifies four personality dichotomies. The MBTI is copyrighted by Consulting Psychologists Press, Inc.

(1) The first dichotomy is extraversion (E) versus introversion (I). Extraverts focus on external stimuli and like variety and action, whereas introverts prefer familiar patterns, rely on their inner ideas, and work alone contentedly.

(2) The second dichotomy is sensing (S) versus intuition (N). Sensing types are attracted to established routines, are good at precise work, and enjoy applying known skills. The intuitives like solving new problems and discovering new relationships, but dislike taking time for precision.

(3) The third dichotomy is perceptive (P) versus judging (J). Perceptive types like to learn about new situations, but may have trouble making decisions. Judging types like to make a careful plan, and will seek to carry through the plan even if new facts change the goal.

(4) The fourth dichotomy is feeling (F) versus thinking (T). Feeling types are aware of other people’s feelings, seek to please others and

relate well to most people. Thinking types are unemotional, may treat people impersonally, and like to put things in logical order.

Each person will exhibit one of each of the dichotomies. There are sixteen distinct personality types. They are listed below with a short description of each. The descriptions are from the MBTI Manual, 3rd ed., Consulting Psychologists Press, Inc., p. 64.

ISTJ – Quiet, dependable, practical, realistic, responsible.

ISFJ – Quiet, friendly, responsible, loyal, and conscientious.

INFJ – Firm values, clear vision, organized, decisive, and conscientious.

INTJ – Original, great drive, skeptical, independent, with high standards.

ISTP – Tolerant, flexible, quietly observes, efficient, and analytical.

ISFP – Quiet, friendly, sensitive, kind, and loyal.

INFP – Idealistic, curious, adaptable, flexible, and accepting.

INTP – Theoretical, abstract, quiet, critical, analytical.

ESTP – Flexible, tolerant, pragmatic, spontaneous, and enjoys comfort and style.

ESFP – Outgoing, friendly, exuberant, accepting, spontaneous.

ENFP – Enthusiastic, imaginative, spontaneous, can improvise, needs affirmation.

ENTP – Quick, ingenious, stimulating, alert, and outspoken.

ESTJ – Practical, realistic, matter-of-fact, decisive, forceful.

ESFJ – Warmhearted, conscientious, cooperative, loyal, wants to be appreciated.

ENFJ – Warm, empathetic, responsive, responsible, sociable.

ENTJ – Frank, decisive, forceful, well informed, assumes leadership.

APPENDIX D

Example of Result From Online Instrument

HUMANMETRICS

Jung - Myers-Briggs Typology

Your Type is

ISFJ

Introverted Sensing Feeling Judging

Strength of the preferences %

22 1 33 89

ISFJ type description by D.Keirsey
ISFJ type description by J. Butt and M.M. Heiss

Qualitative analysis of your type formula

You are:

- slightly expressed introvert
- slightly expressed sensing personality
- moderately expressed feeling personality
- very expressed judging personality

APPENDIX E

Measurements of Central Tendency

Measurements of Central Tendency

In order to gain a clearer picture of the sample population it is helpful to look at the measurements of central tendency. The following table provides the values useful to this evaluation.

Table E1

Measurements of Central Tendency

Measurement	Age	Gender	Class	Major	Citizenship
N	984	984	984	984	984
Mean	21.76	1.41	2.44	1.60	1.16
Median	21.00	1.00	2.00	2.00	1.00
Mode	16	1	1	2	1
Standard Deviation	7.952	.491	1.226	.490	.365
Variance	63.236	.242	1.504	.240	.134

Note. The coding for this table was as follows:

Gender: Females = 1, Males = 2

Class: Freshmen = 1, Sophomore = 2, Junior = 3, Senior = 4

Major: Business = 1, Other = 2

U.S. Citizen: Yes = 1, No = 2

APPENDIX F

Chi-Square Tables

Table F1

Chi-square Values for Gender Against Information Source

Gender	df	N	x^2
Male	4	400	125.62
Female	4	584	118.00

Note. The value for which x^2 becomes significant at the .05 level and with 4 degrees of freedom is 9.49.

Table F2

Chi-square Values for Citizenship Against Information Source

Citizenship	df	N	x^2
U.S. Citizen	4	828	197.43
Non U.S. Citizen	4	156	61.37

Note. The value for which x^2 becomes significant at the .05 level and with 4 degrees of freedom is 9.49.

Table F3

Chi-square Values for Age Range Against Information Source

Age Range	df	N	x^2
16 – 20	4	433	95.32
21 – 30	4	358	133.79
31 – 40	4	111	57.96
41 – 50	4	66	20.06
50 and Over	4	16	8.375

Note. The value for which x^2 becomes significant at the .05 level and with 4 degrees of freedom is 9.49.

Table F4

Chi-square for Major Against Information Source

Major	df	N	x^2
Business	4	393	104.03
Fine Arts	4	69	38.32
Liberal Arts	4	91	13.78
Science	4	114	47.49
Other	4	317	51.19

Note. The value for which x^2 becomes significant at the .05 level and with 4 degrees of freedom is 9.49.

Table F5

Chi-square for Class Standing Against Information Source

Class Standing	df	N	x^2	Conclusion
Freshman	4	336	66.62	Reject the H_0
Sophomore	4	159	62.23	Reject the H_0
Junior	4	207	91.33	Reject the H_0
Senior	4	282	118.71	Reject the H_0

Note. The value for which x^2 becomes significant at the .05 level and with 4 degrees of freedom is 9.49.

Table F6

Chi-square Values for Extraversion Expressed MBTI Against Information Sources

MBTI Type	df	N	x^2
ENFJ	4	123	22.65
ENTJ	4	76	24.0
ENTP	4	46	36.39
ENFP	4	64	8.66
ESFJ	4	138	25.55
ESTJ	4	74	8.43
ESTP	4	51	37.72
ESFP	4	43	9.91

Note. Two of the types reject the null hypothesis (H_0). In those cases the differences in sample data are not statistically significant and may be attributed to chance. Still, the value for which x^2 becomes significant at the .05 level and with 4 degrees of freedom is 9.49. Note that the x^2 for the two types in question is not far from that value.

Table F7

Chi-square Values for Introvert Expressed MBTI Against Information Sources

MBTI Type	df	N	x^2
INFJ	4	62	15.58
INFP	4	47	42.68
INTJ	4	88	14.61
INTP	4	46	18.13
ISFJ	4	98	20.77
ISFP	4	53	32.19
ISTJ	4	80	5.5
ISTP	4	40	53.75

Note. For this calculation, the value for which x^2 becomes significant at the .05 level and with 4 degrees of freedom is 9.49. Note the rejection of the null hypothesis (H_0) by only one type.

Table F8

Chi-square Values for Gender Against Relevance Criteria

Gender	df	N	x^2
Male	24	2747	470.35
Female	24	4393	893.51

Note. For this calculation, the value for which $\mathbf{x}^2$ becomes significant at the .05 level and with 24 degrees of freedom is 36.42.

Table F9

Chi-square Values for Citizenship Against Relevance Criteria

Citizen	df	N	x^2
U.S. Citizen	24	6370	1294.86
Non U.S. Citizen	24	773	112.54

Note. For this calculation, the value for which $\mathbf{x}^2$ becomes significant at the .05 level and with 24 degrees of freedom is 36.42.

Table F10

Chi-square Values for Age Range Against Relevance Criteria

Age Range	df	N	x^2
16 – 20	24	2910	518.38
21 – 30	24	2746	555.66
31 – 40	24	886	176.47
41 – 50	24	485	136.60
51 and over	24	114	40.39

Note. For this calculation, the value for which $\mathbf{x}^2$ becomes significant at the .05 level and with 24 degrees of freedom is 36.42.

Table F11

Chi-square Values for Major Against Relevance Criteria

Major	df	N	x^2
Business	24	2787	531.16
Fine Arts	24	476	121.90
Liberal Arts	24	705	163.19
Science	24	827	141.41
Other	24	2356	441.69

Note. The value for which H_0 is accepted is 36.42.

Table F12

Chi-square Values for Class Standing Against Relevance Criteria

Class Standing	df	N	x^2
Freshman	24	2247	400.00
Sophomore	24	1262	174.73
Junior	24	1430	272.27
Senior	24	2202	573.54

Note. The value for which H_0 is accepted is 36.42.

Table F13

Chi-square Values for MBTI Against Relevance Criteria

MBTI Type	df	N	x^2
INFJ	24	275	63.09
INFP	24	168	84.98
INTJ	24	535	181.31
INTP	24	277	53.59
ISFJ	24	601	183.90
ISFP	24	379	61.69
ISTJ	24	417	69.99
ISTP	24	243	99.28
ENFJ	24	825	178
ENFP	24	363	92.03
ENTJ	24	619	132.90
ENTP	24	428	91.04
ESFJ	24	875	222.57
ESFP	24	256	64.51
ESTJ	24	369	138.25
ESTP	24	361	78.82

Note. For this calculation, the value for which $\mathbf{x}^2$ becomes significant at the .05 level and with 24 degrees of freedom is 36.42.

APPENDIX G

ANOVA Tables

Table G1

One Way ANOVA for Information Source Against MBTI Type

Information Source	$F_{(15, 968)}$
Catalog	1.950*
Printed Schedule	3.010*
Friends/Family	4.646*
Professor/Advisor	2.057*
Online	6.304*

Note. * All information sources show significant values at the .05 level. The ANOVA calculations were performed using the statistical software SPSS.

Table G2

One Way ANOVA for Relevance Criteria Against MBTI Type

Relevance Criteria	$F_{(15, 968)}$
About my topic	3.281*
Easy to obtain	3.159*
Unique or only source	3.119*
New source for me to use	3.136*
Current information	1.883*
Credible	3.267*
Accurate	.843*
Understandable	.971*
Consistent	1.826*
Presentation information	1.205*
Comprehensive	1.643*
Suitably general or specific	.885*
Detailed	2.355*
Prominent	3.829*
I know the source	2.450*
Reputable	1.620*
Format of source	3.043*
Interactive	1.612*
Interpersonal	3.079*
Provides examples	1.447*
Provides links to other sources	1.267*
I like it	1.712*
Validates my viewpoint	2.976*
Interesting	3.479*
Enjoyable	3.630*

Note. * These values are significant at the .05 level. The ANOVA calculations were performed using the statistical software SPSS. Note the large number of relevance criteria with significant values.

APPENDIX H

Frequency Charts for Information Source

Table H1

Frequency of Information Source Ranked as “Most” Important by Gender

Gender	Catalog	Printed Schedule	Friends/ Family	Professor/ Advisor	Online
Male	103	146	52	85	14
Female	138	206	83	104	53

Table H2

Frequency of Information Source Ranked as “Most” Important by Citizenship

Citizenship	Catalog	Printed Schedule	Friends/ Family	Professor/ Advisor	Online
U.S. Citizen	201	291	99	177	60
Non-U.S. Citizen	42	60	35	12	7

Table H3

Frequency of Information Source Ranked as “Most” Important by Age Range

Age Range	Catalog	Printed Schedule	Friends/ Family	Professor/ Advisor	Online
16 – 20	118	120	88	98	9
21 – 30	77	152	37	63	29
31 – 40	21	53	7	14	16
41 – 50	19	22	1	13	11
51 and over	6	6	1	1	2

Table H4

Frequency of Information Source Ranked “Most” Important by Major

Major	Catalog	Printed Schedule	Friends/ Family	Professor/ Advisor	Online
Business	88	157	45	67	36
Fine Arts	16	30	6	17	0
Liberal Arts	26	27	14	15	9
Science	26	44	13	30	1
Other	86	93	56	61	21

Table H5

Frequency of Information Source Ranked “Most” Important by Class

Class	Catalog	Printed Schedule	Friends/ Family	Professor/ Advisor	Online
Freshman	93	75	74	85	9
Sophomore	35	65	26	30	3
Junior	54	89	23	29	12
Senior	61	122	11	45	43

Table H6

The Frequency of Information Source Chosen "Extremely Important" by MBTI Type

MBTI Type	Catalog	Printed Schedule	Family/ Friends	Professor/ Advisor	Online
ESFP	9	8	15	9	2
ENFJ	26	37	13	35	12
ENTJ	25	25	7	14	5
ENTP	7	25	4	8	2
ENFP	12	19	16	12	5
ESFJ	31	44	19	34	10
ESTJ	20	19	11	17	7
ESTP	4	18	6	23	0
INFJ	16	23	8	8	7
INFP	8	27	5	4	3
INTJ	21	22	6	13	26
INTP	6	17	11	12	0
ISFJ	26	33	15	17	7
ISFP	7	23	17	6	0
ISTJ	17	22	15	17	9
ISTP	5	25	0	10	0

APPENDIX I

Demographic Frequency Charts Depicting Relevance Criteria Ratings

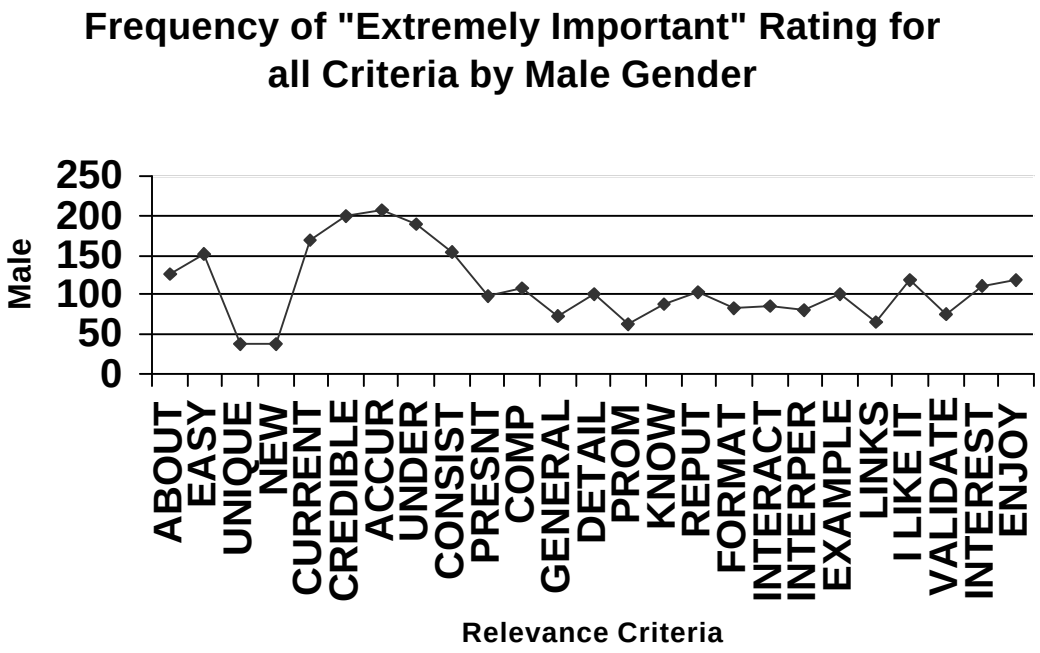


Figure I1. This chart shows the frequency with which male students rated each relevance criterion as "Extremely important".

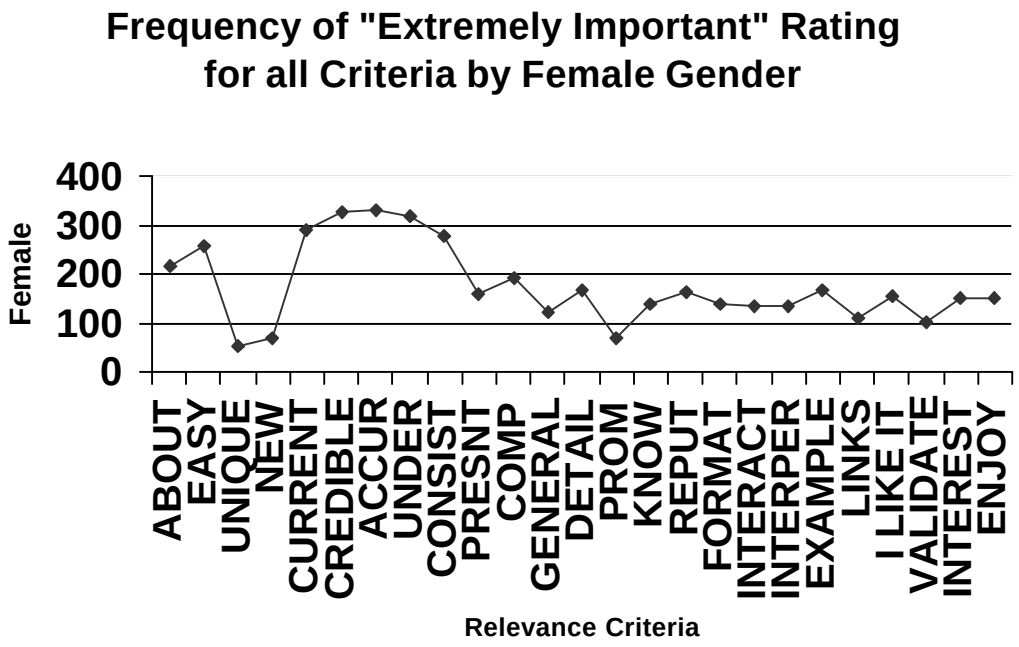


Figure I2. This chart shows the frequency with which female students rated each relevance criterion as "Extremely important".

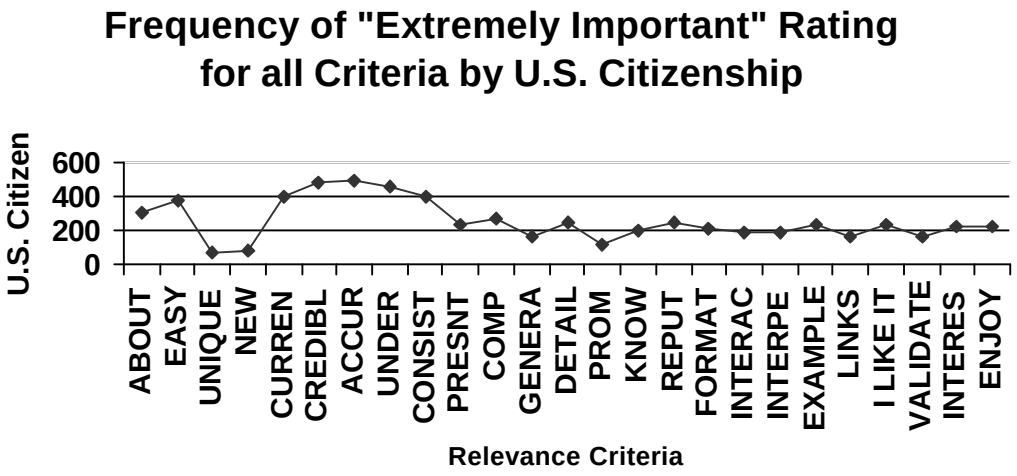


Figure I3. This chart shows the frequency with which students who are U.S. citizens rated each relevance criterion as “Extremely important”.

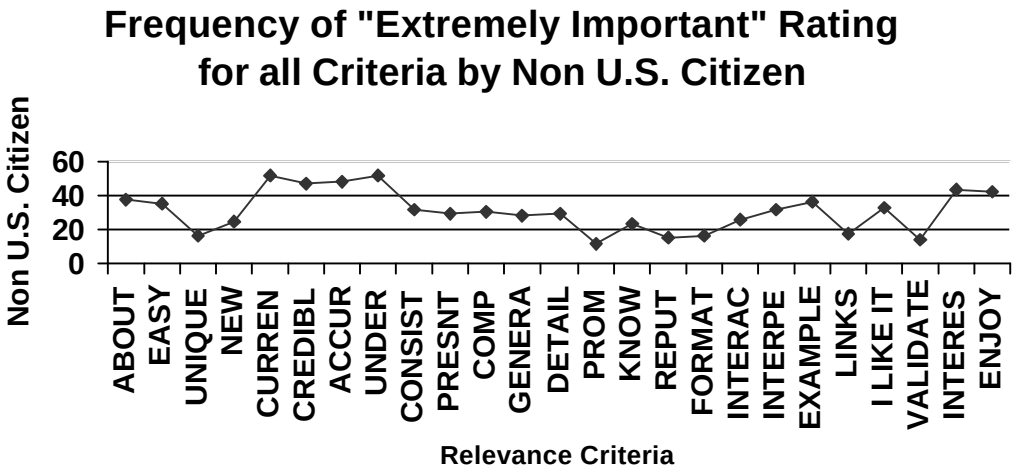


Figure I4. This chart shows the frequency with which students who are not U.S. citizens rated each relevance criterion as “Extremely important”.

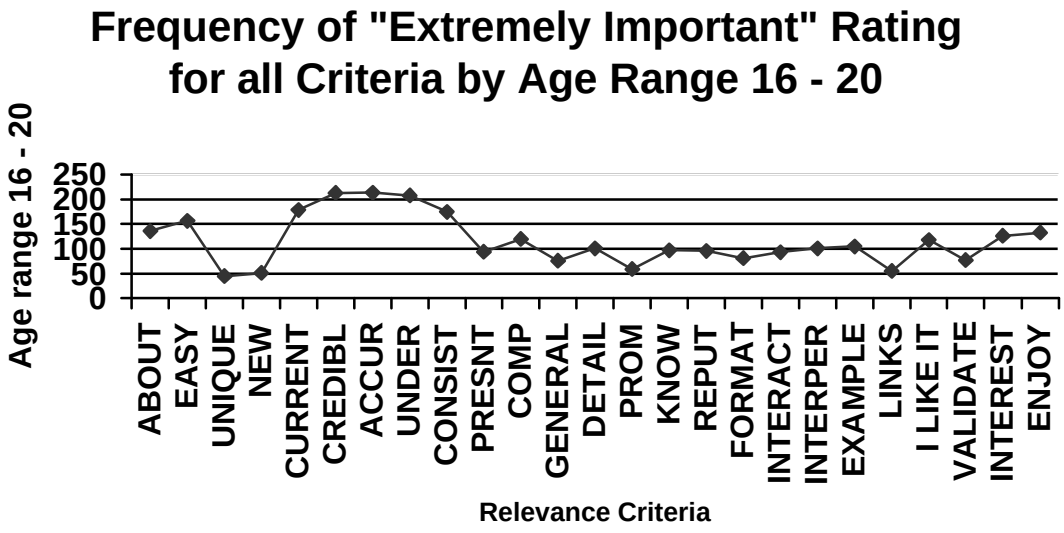


Figure I5. This chart shows the frequency with which students in the age range 16 - 20 rated each relevance criterion as “Extremely important”.

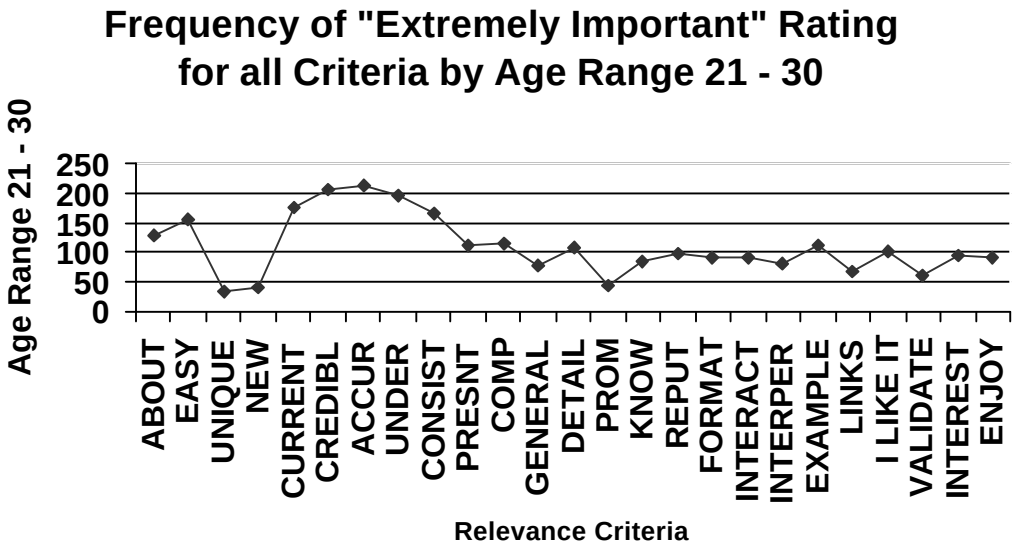


Figure I6. This chart shows the frequency with which students in the age range 21 - 30 rated each relevance criterion as “Extremely important”.

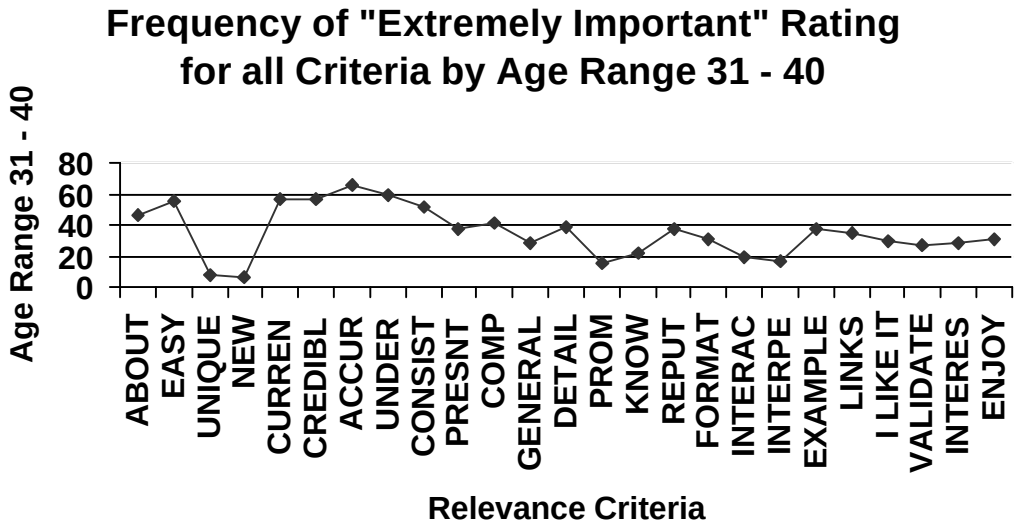


Figure I7. This chart shows the frequency with which students in the age range 31 - 40 rated each relevance criterion as “Extremely important”.

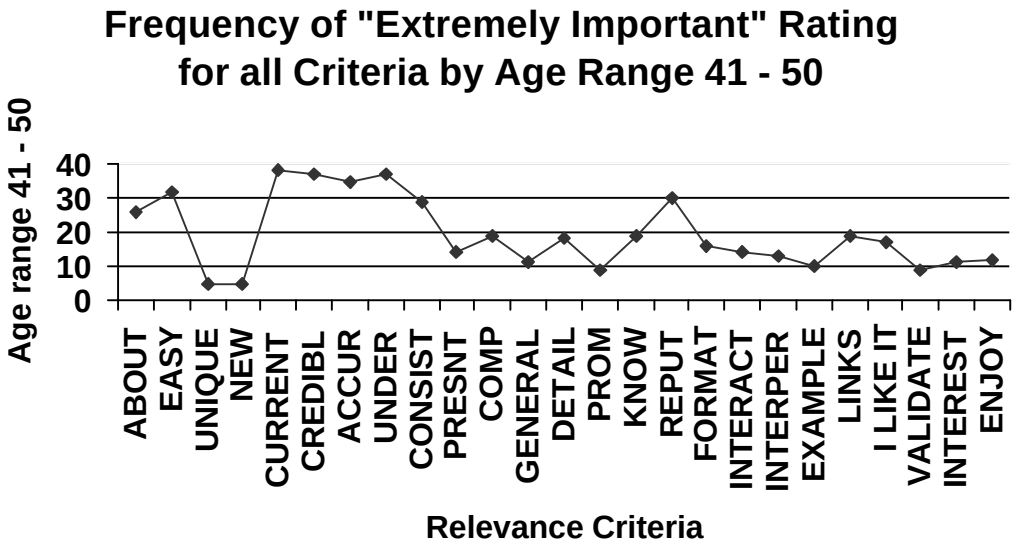


Figure I8. This chart shows the frequency with which students in the age range 41 - 50 rated each relevance criterion as “Extremely important”.

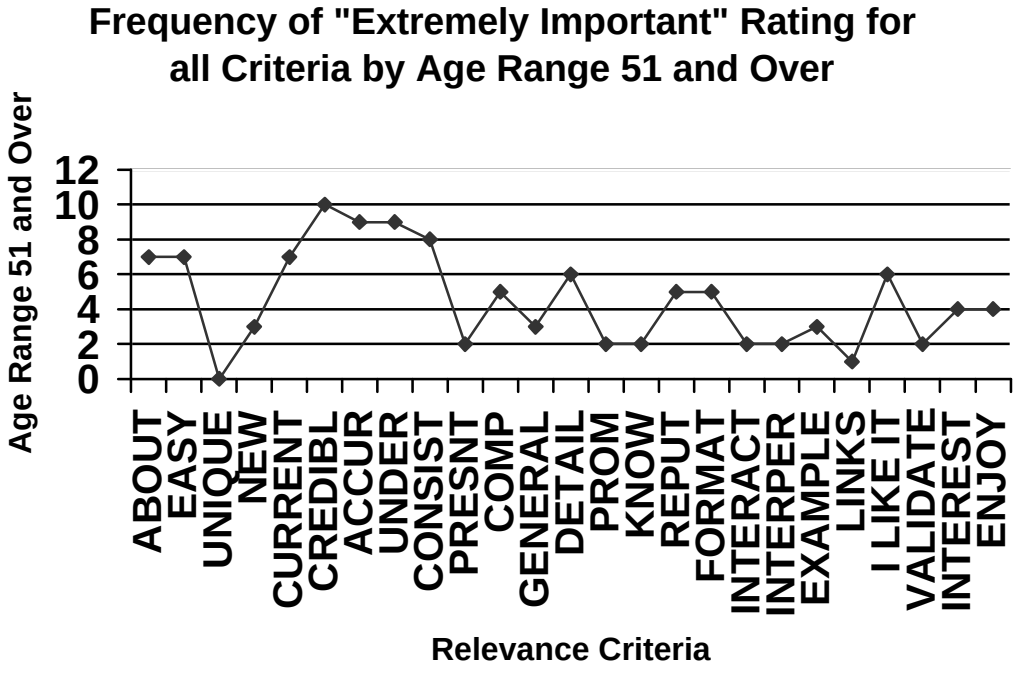


Figure I9. This chart shows the frequency with which students in the age range 51 and over rated each relevance criterion as “Extremely important”.

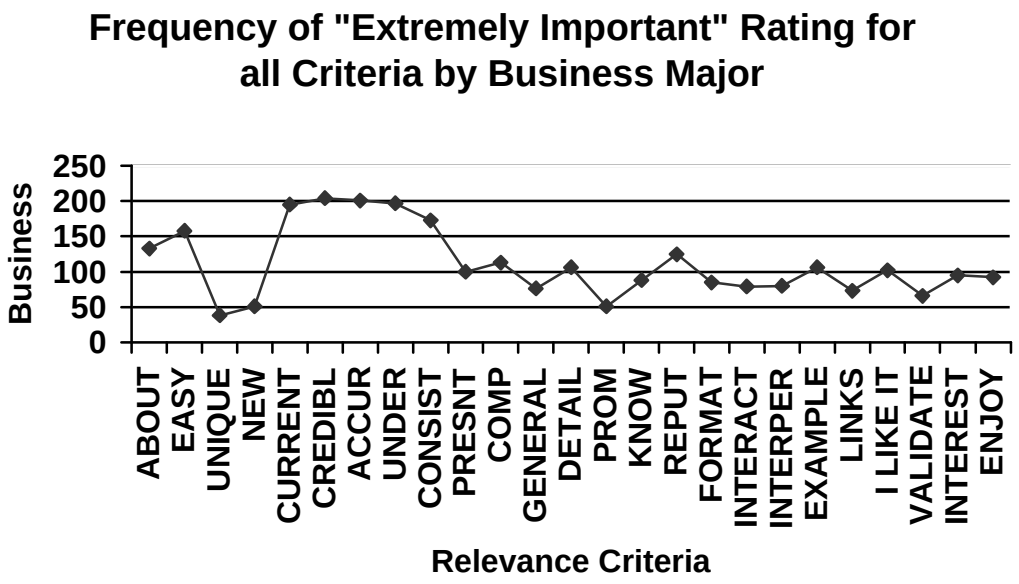


Figure I10. This chart shows the frequency with which students declaring the business major rated each relevance criterion as “Extremely important”.

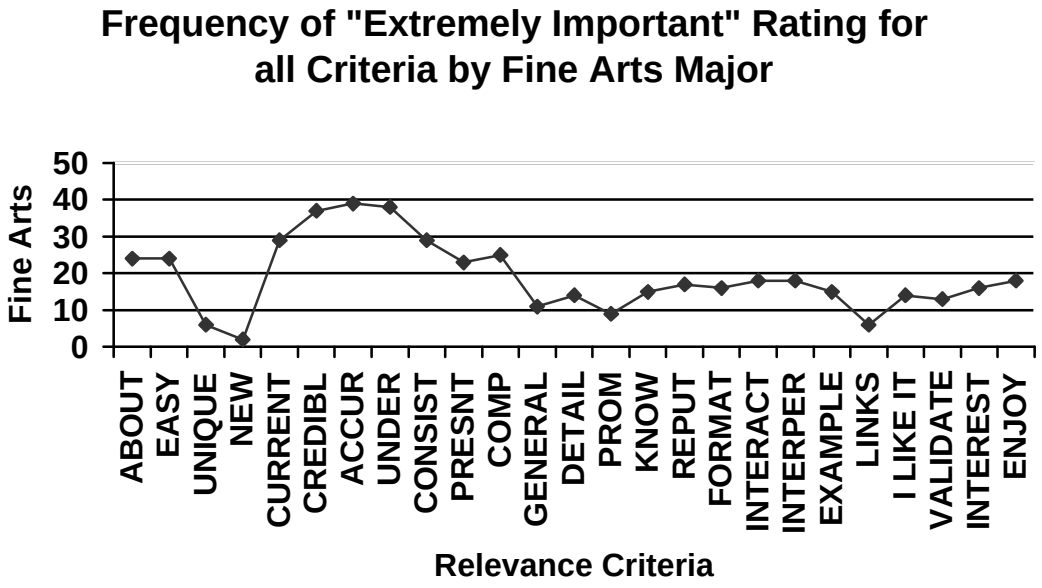


Figure I11. This chart shows the frequency with which students declaring the fine arts major rated each relevance criterion as “Extremely important”.

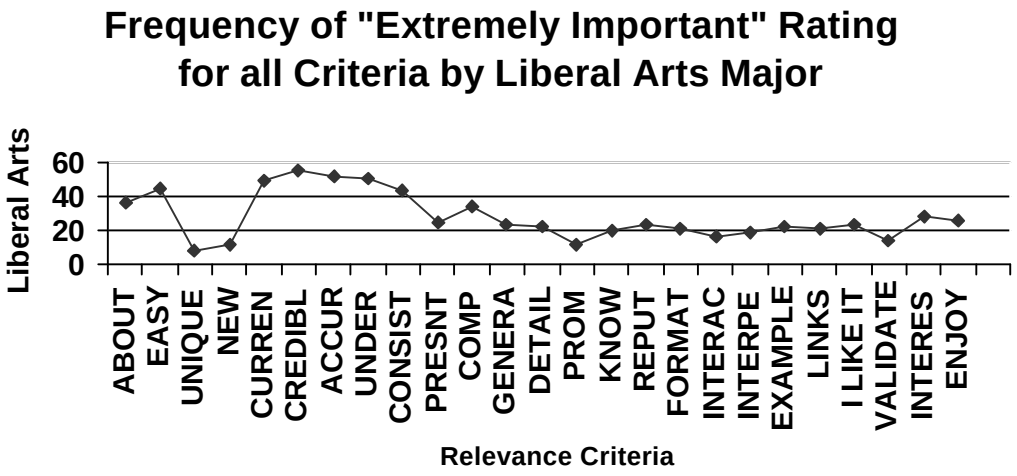


Figure I12. This chart shows the frequency with which students declaring the liberal arts major rated each relevance criterion as “Extremely important”.

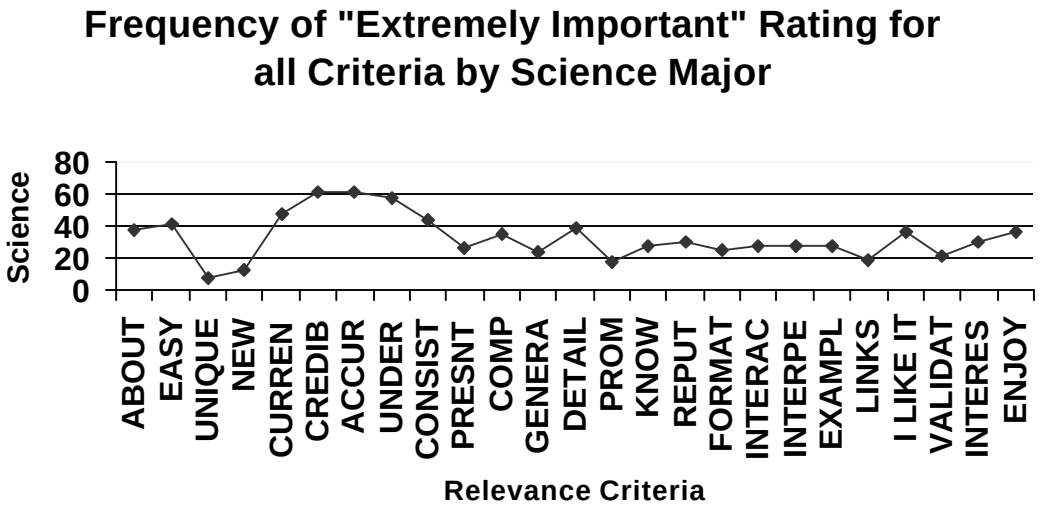


Figure I13. This chart shows the frequency with which students declaring the science major rated each relevance criterion as “Extremely important”.

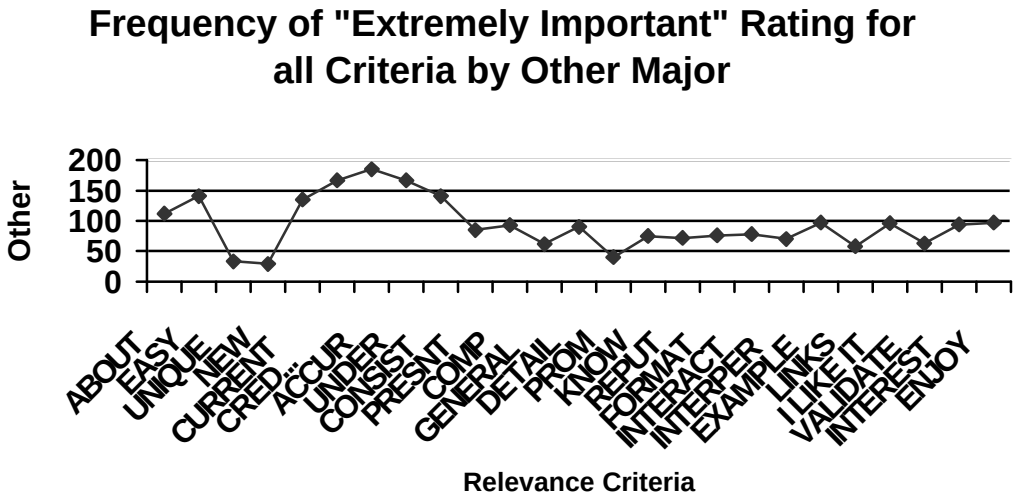


Figure I14. This chart shows the frequency with which students declaring a major in other fields rated each relevance criterion as “Extremely important”.

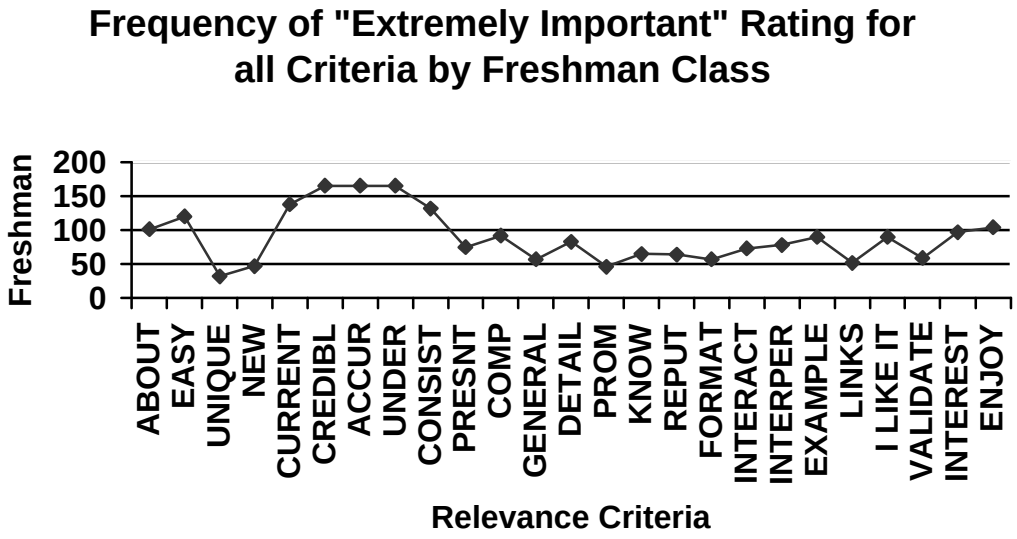


Figure I15. This chart shows the frequency with which students in the freshman class rated each relevance criterion as “Extremely important”.

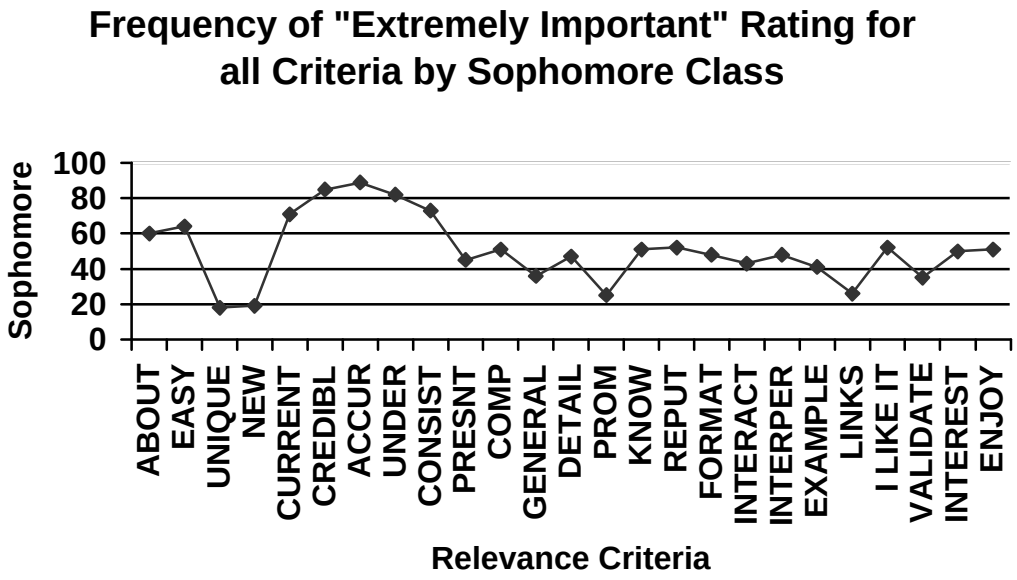


Figure I16. This chart shows the frequency with which students in the sophomore class rated each relevance criterion as “Extremely important”.

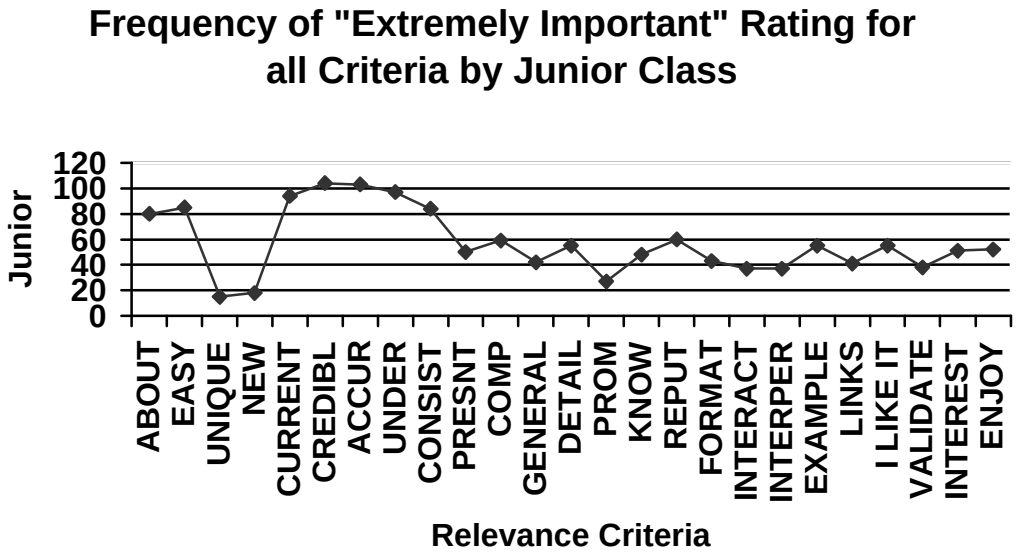


Figure I17. This chart shows the frequency with which students in the junior class rated each relevance criterion as “Extremely important”.

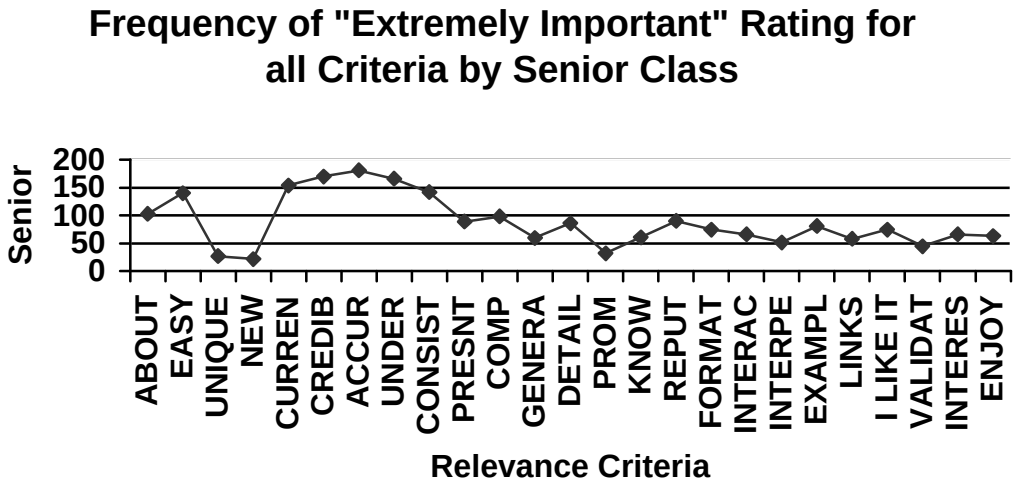


Figure I18. This chart shows the frequency with which students in the senior class rated each relevance criterion as “Extremely important”.

APPENDIX J

Charts Depicting the Frequency With Which MBTI Type Rated Relevance Criteria as Extremely Important

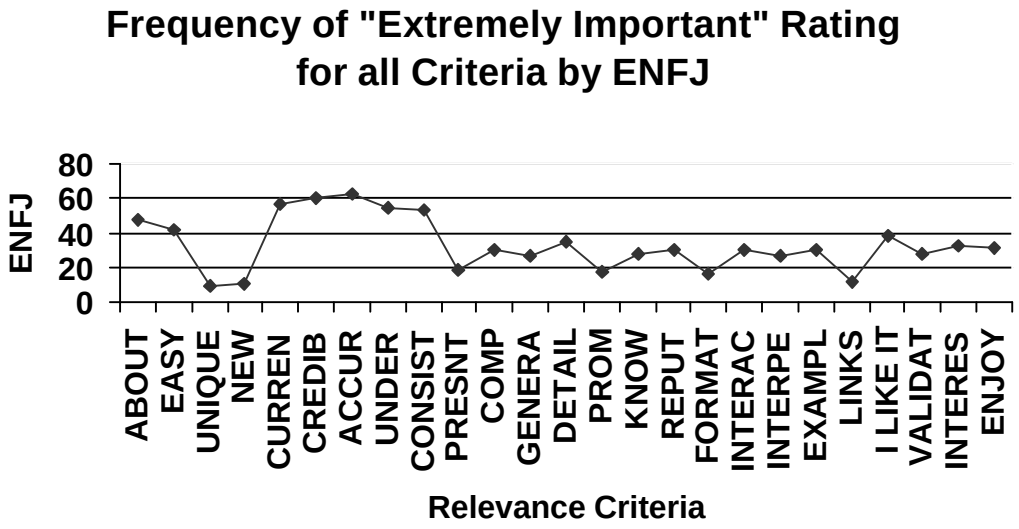


Figure J1. This chart shows the frequency with which students with the ENFJ MBTI type rated each relevance criterion as “Extremely important”.

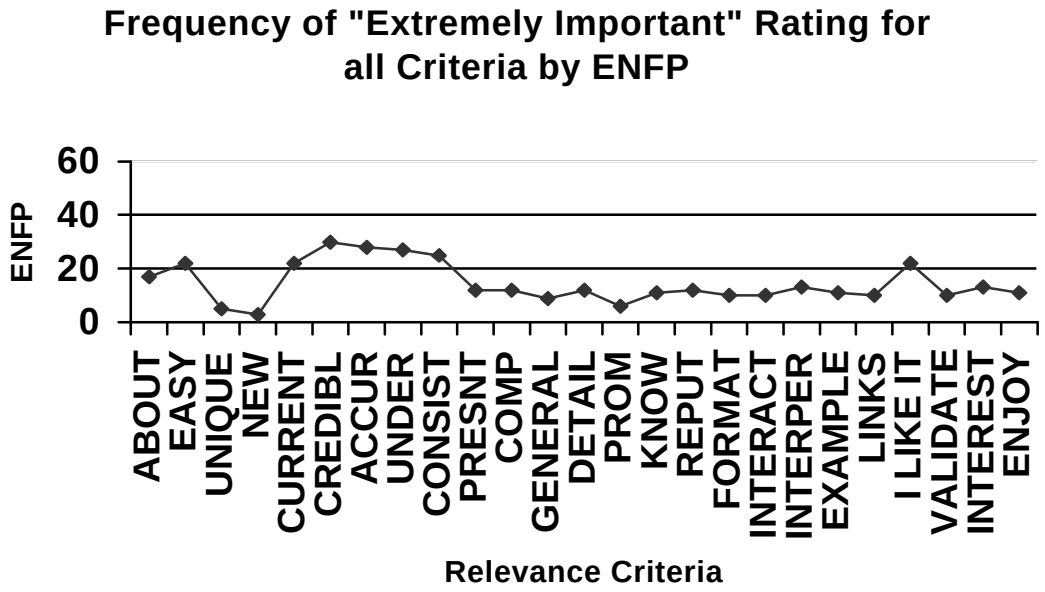


Figure J2. This chart shows the frequency with which students with the ENFP MBTI type rated each relevance criterion as “Extremely important”.

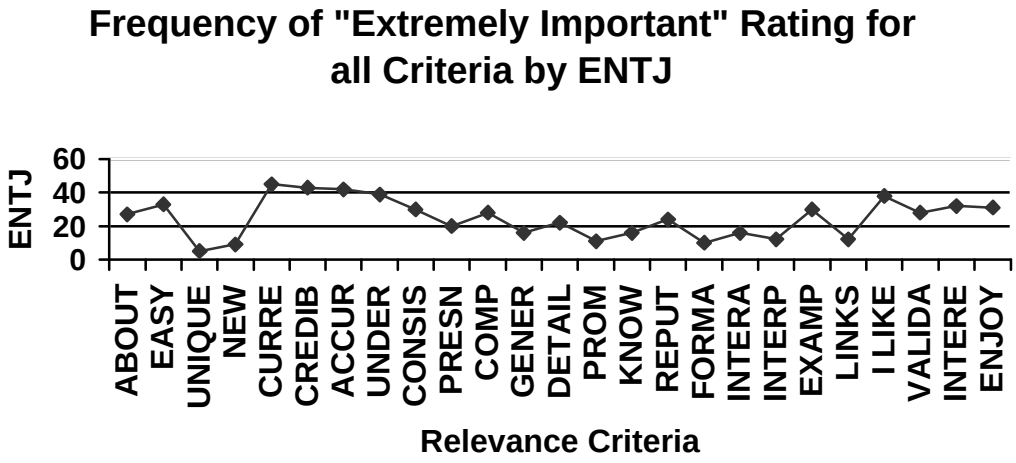


Figure J3. This chart shows the frequency with which students with the ENTJ MBTI type rated each relevance criterion as "Extremely important".

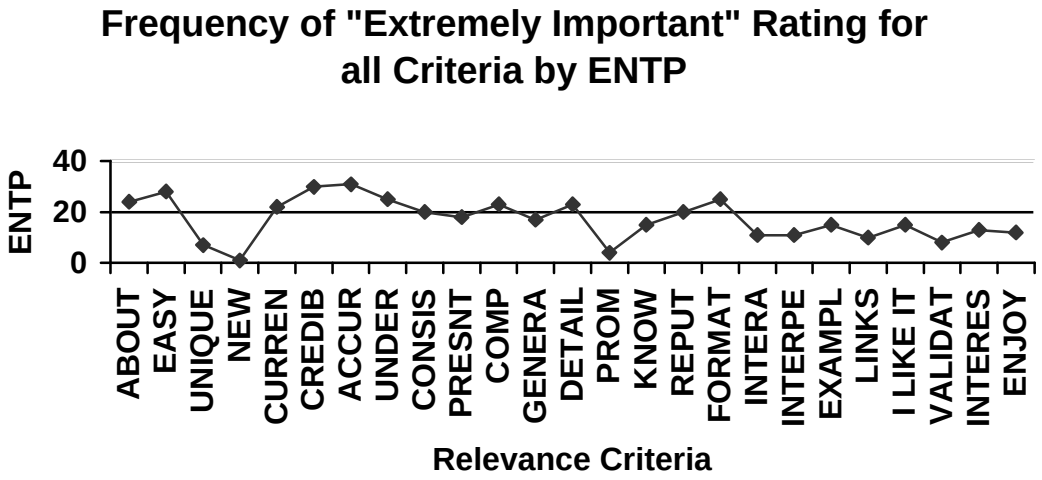


Figure J4. This chart shows the frequency with which students with the ENTP MBTI type rated each relevance criterion as "Extremely important".

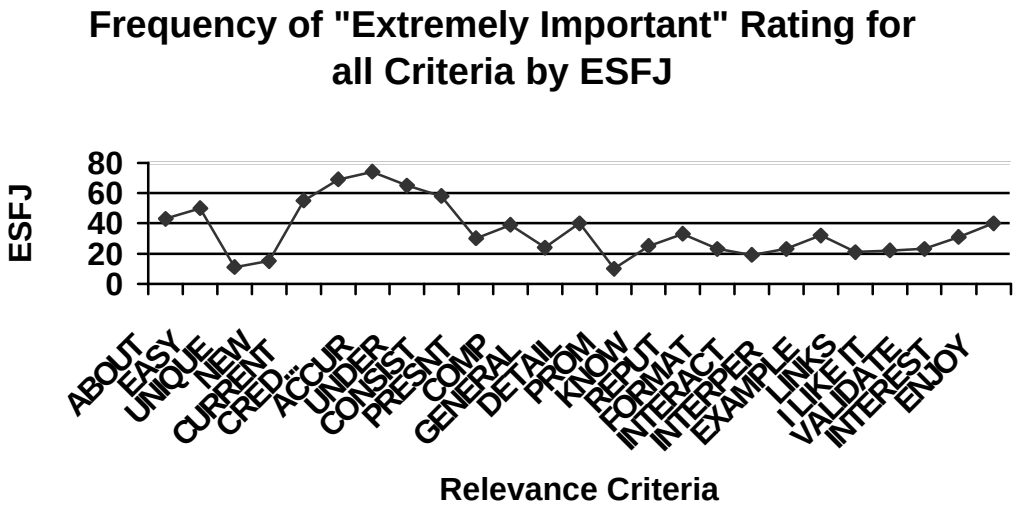


Figure J5. This chart shows the frequency with which students with the ESFJ MBTI type rated each relevance criterion as “Extremely important”.

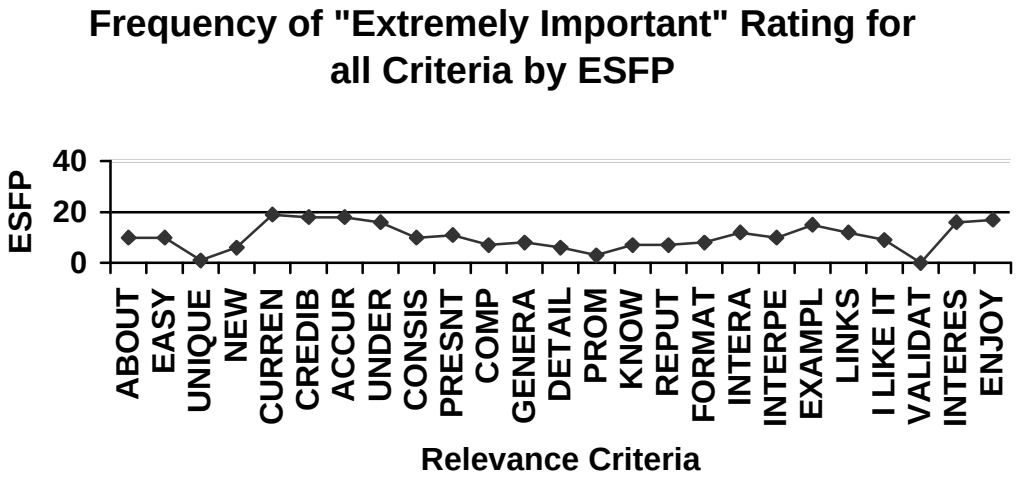


Figure J6. This chart shows the frequency with which students with the ESFJ MBTI type rated each relevance criterion as “Extremely important”.

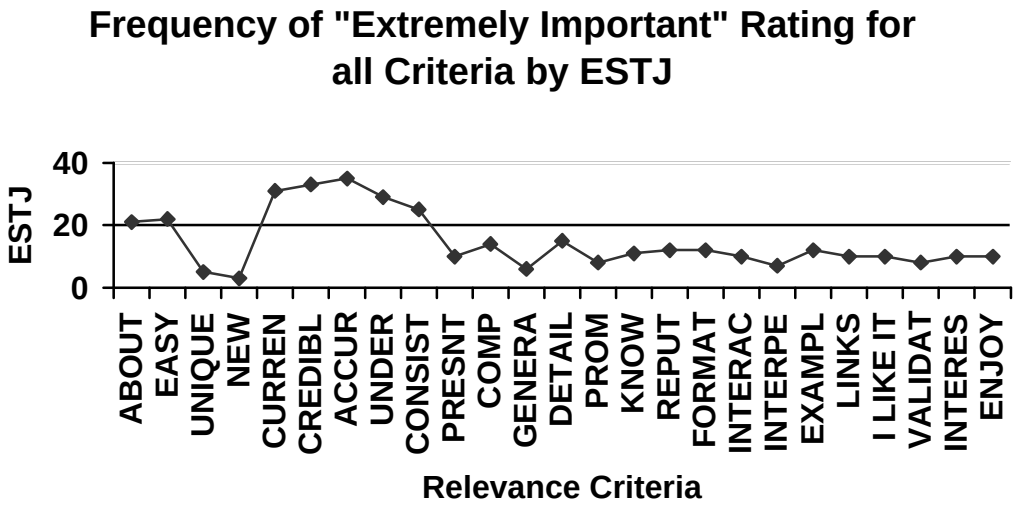


Figure J7. This chart shows the frequency with which students with the ESTJ MBTI type rated each relevance criterion as “Extremely important”.

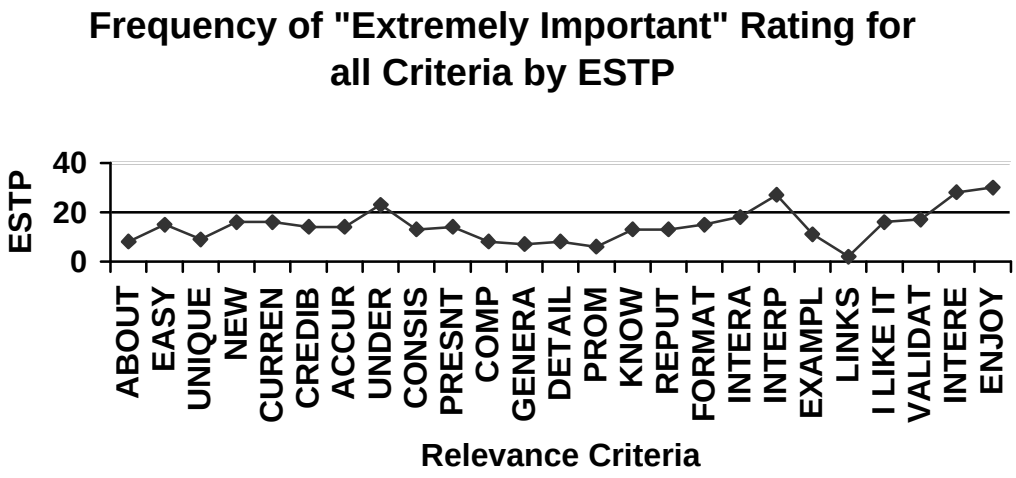


Figure J8. This chart shows the frequency with which students with the ESTP MBTI type rated each relevance criterion as “Extremely important”.

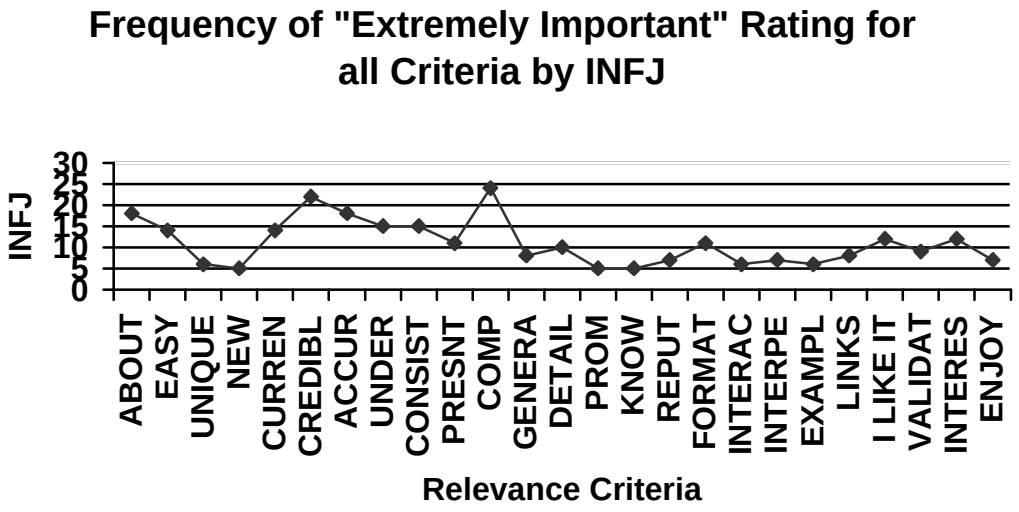


Figure J9. This chart shows the frequency with which students with the INFJ MBTI type rated each relevance criterion as “Extremely important”.

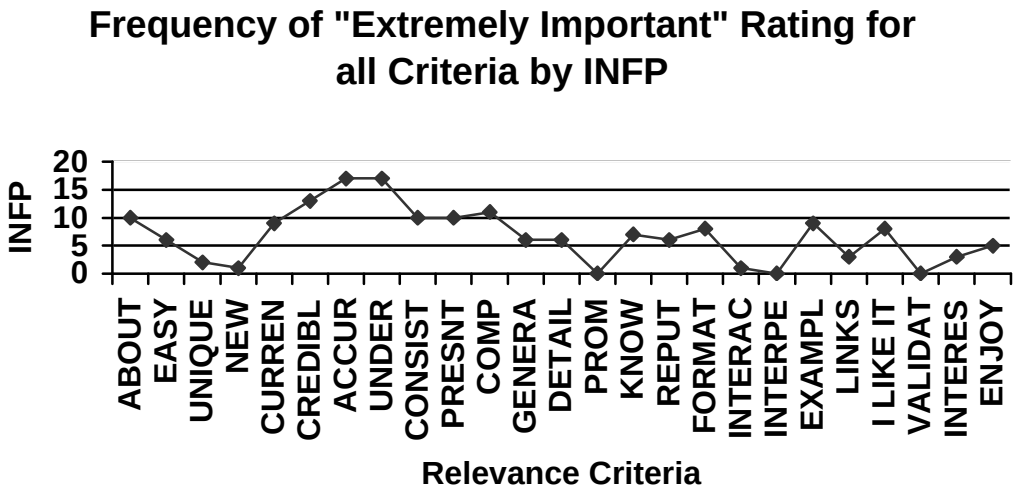


Figure J10. This chart shows the frequency with which students with the INFP MBTI type rated each relevance criterion as “Extremely important”.

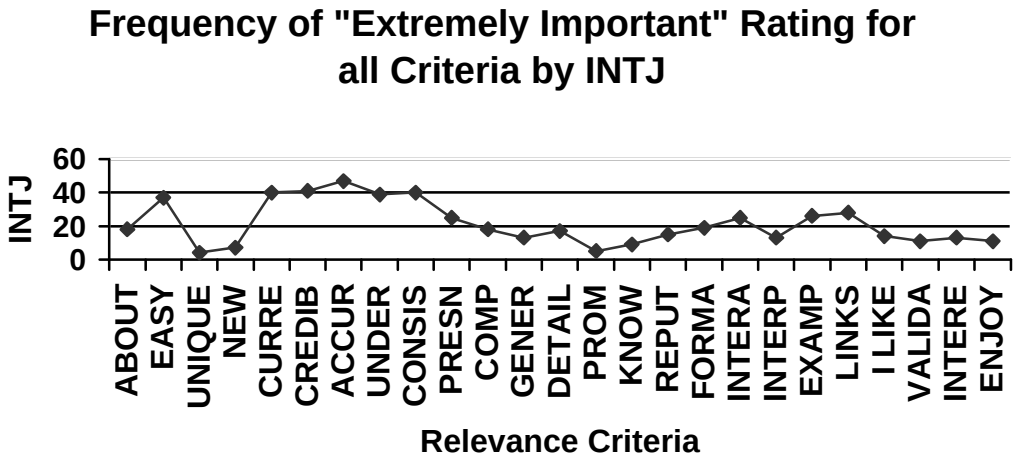


Figure J11. This chart shows the frequency with which students with the INTJ MBTI type rated each relevance criterion as “Extremely important”.

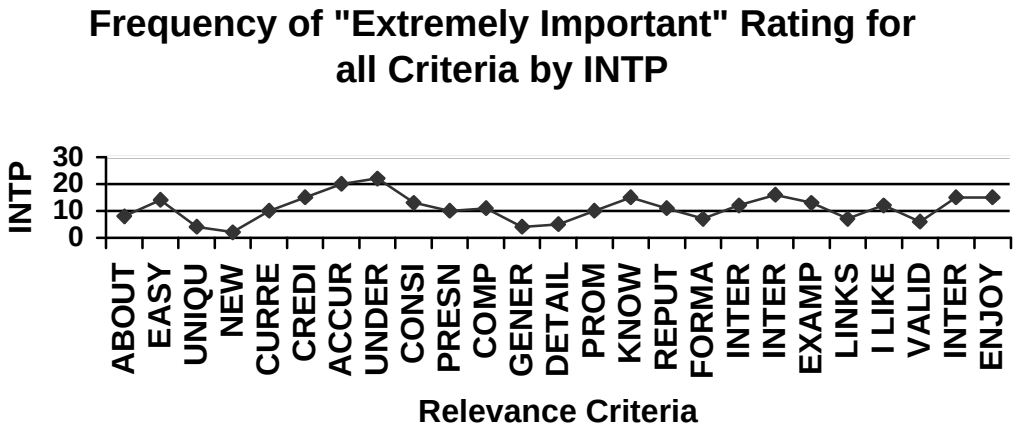


Figure J12. This chart shows the frequency with which students with the INTP MBTI type rated each relevance criterion as “Extremely important”.

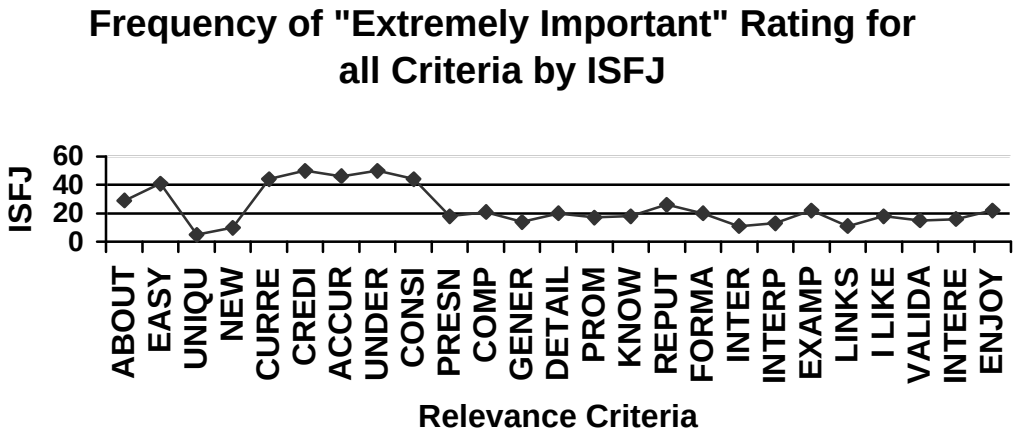


Figure J13. This chart shows the frequency with which students with the ISFJ MBTI type rated each relevance criterion as “Extremely important”.

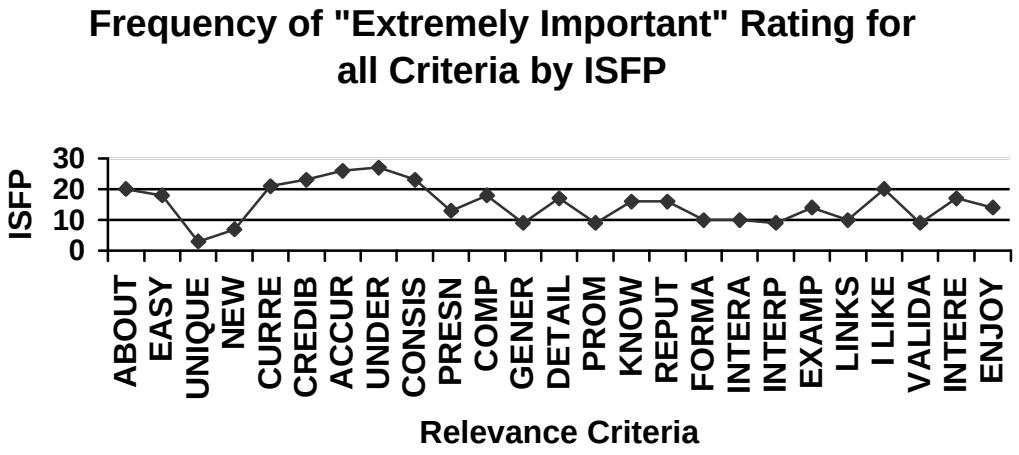


Figure J14. This chart shows the frequency with which students with the ISFP MBTI type rated each relevance criterion as “Extremely important”.

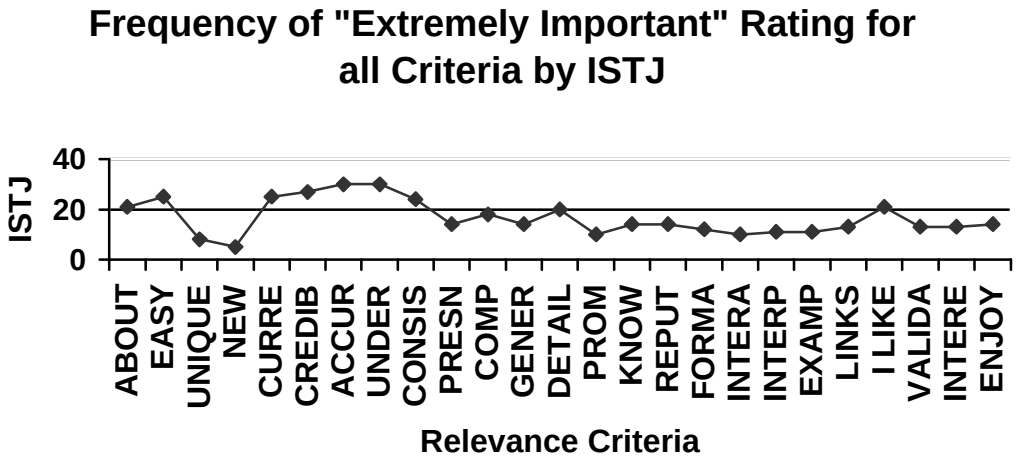


Figure J15. This chart shows the frequency with which students with the ISTJ MBTI type rated each relevance criterion as “Extremely important”.

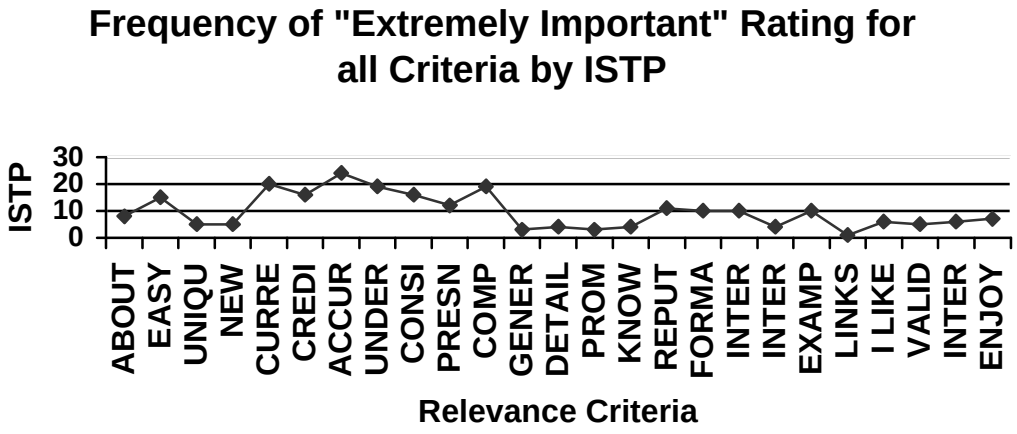


Figure J16. This chart shows the frequency with which students with the ESFJ MBTI type rated each relevance criterion as “Extremely important”.

APPENDIX K

Mean Values

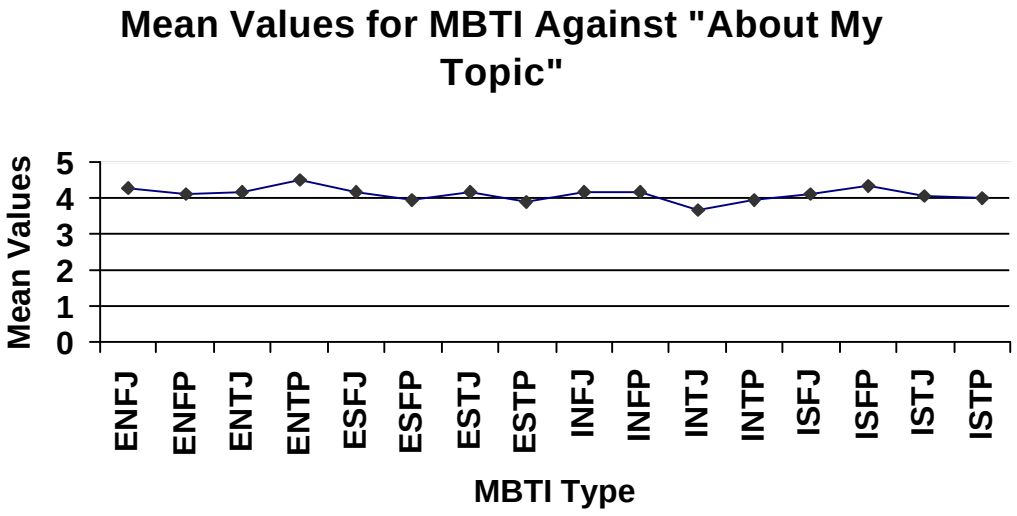
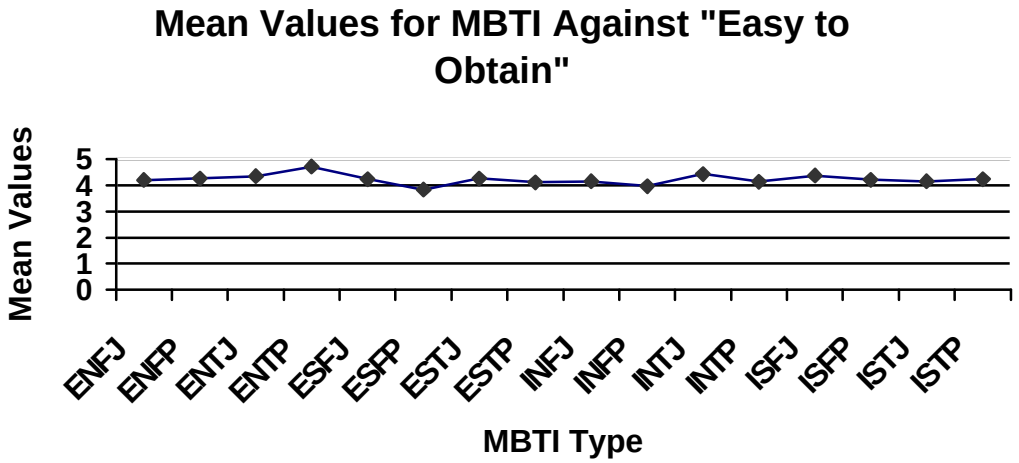


Figure K1. This chart shows the mean values for MBTI against a relevance criterion.



*Figure*K2. This chart shows the mean value for MBTI against a relevance criterion.

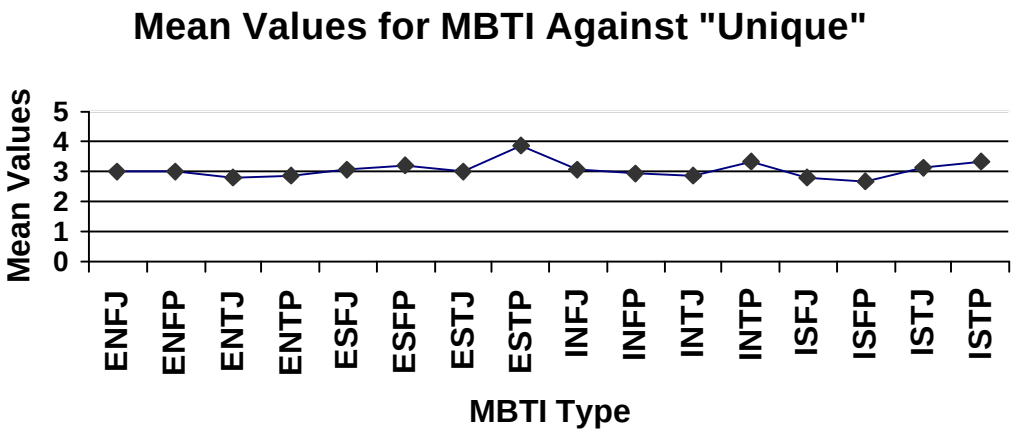


Figure K3. This chart shows the mean value for MBTI against a relevance criterion.

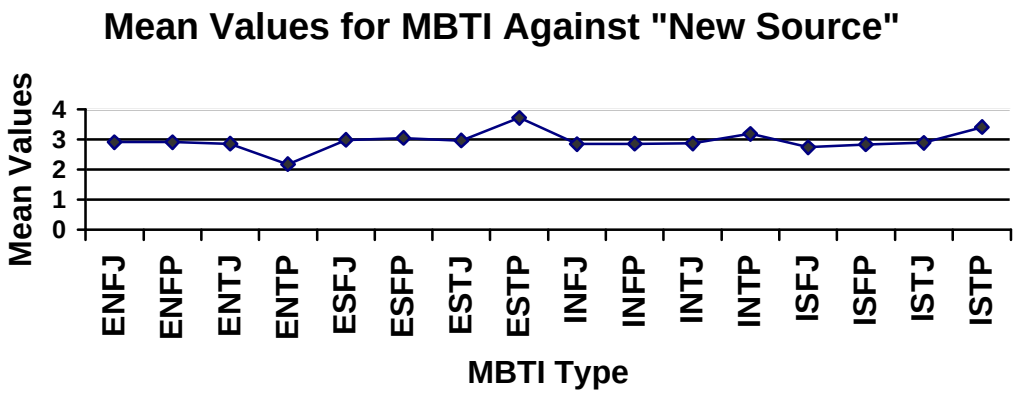


Figure K4. This chart shows the mean value for MBTI against a relevance criterion.

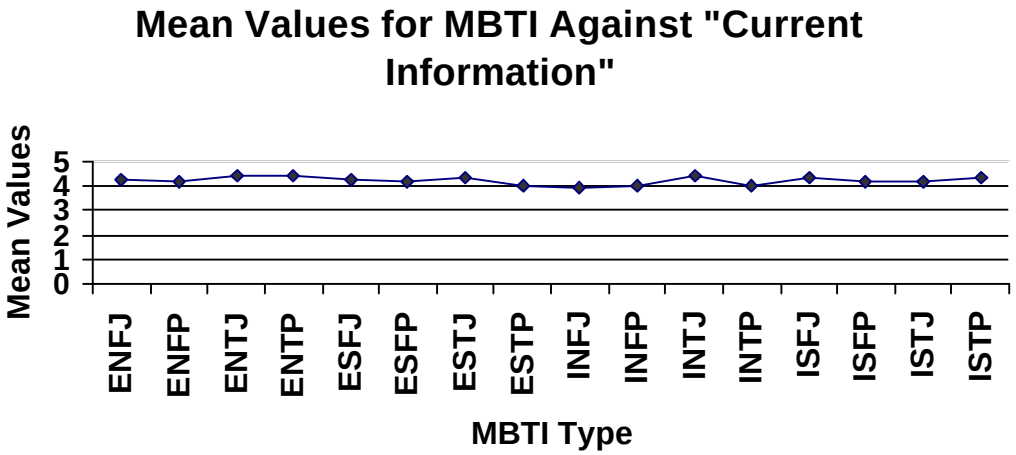


Figure K5. This chart shows the mean value for MBTI against a relevance criterion.

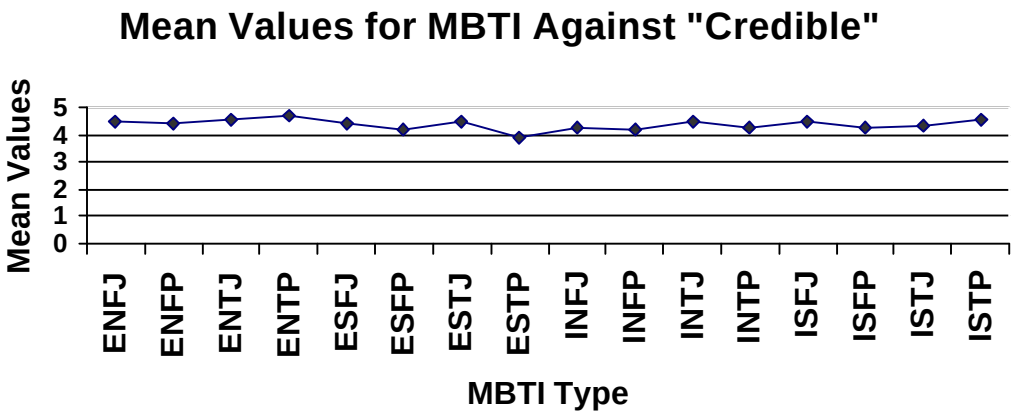


Figure K6. This chart shows the mean value for MBTI against a relevance criterion.

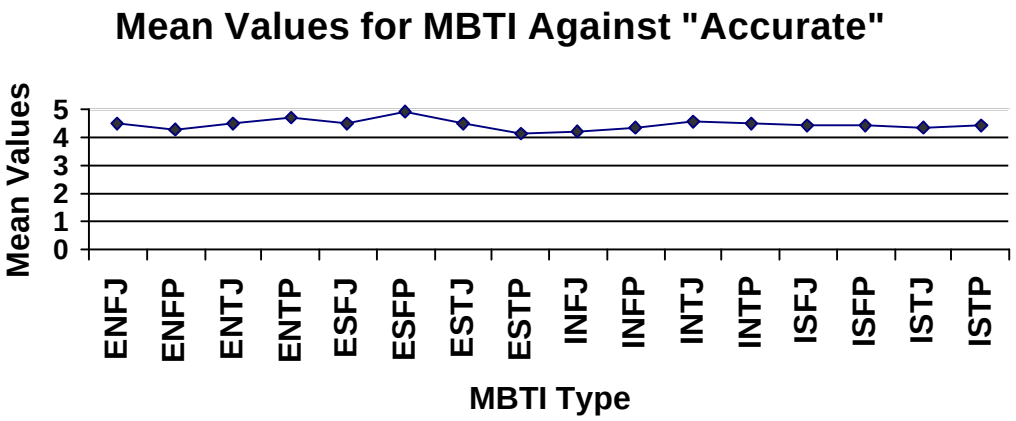


Figure K7. This chart shows the mean value for MBTI against a relevance criterion.

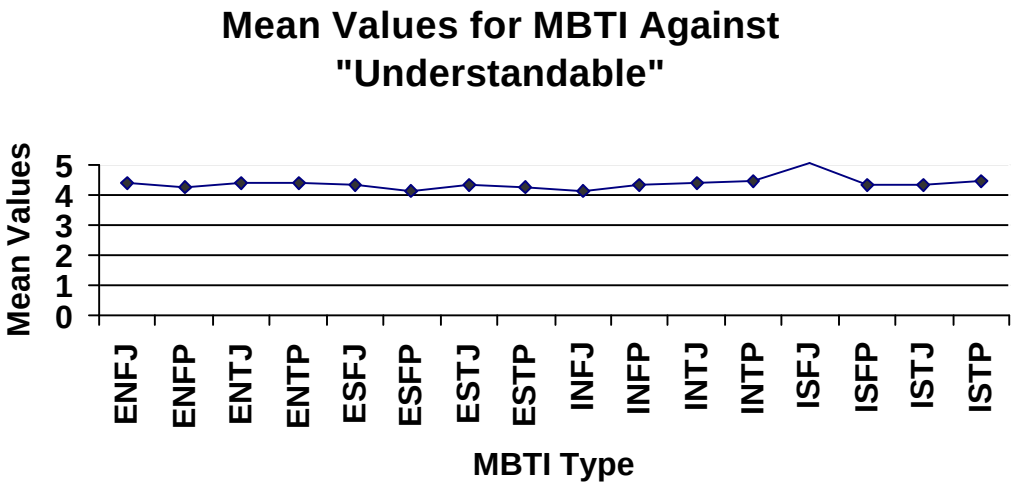


Figure K8. This chart shows the mean value for MBTI against a relevance criterion.

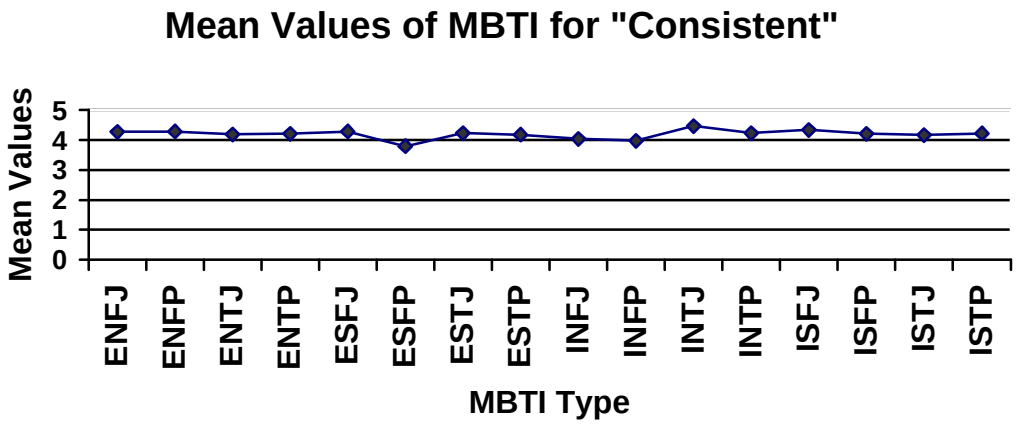


Figure K9. This chart shows the mean value for MBTI against a relevance criterion.

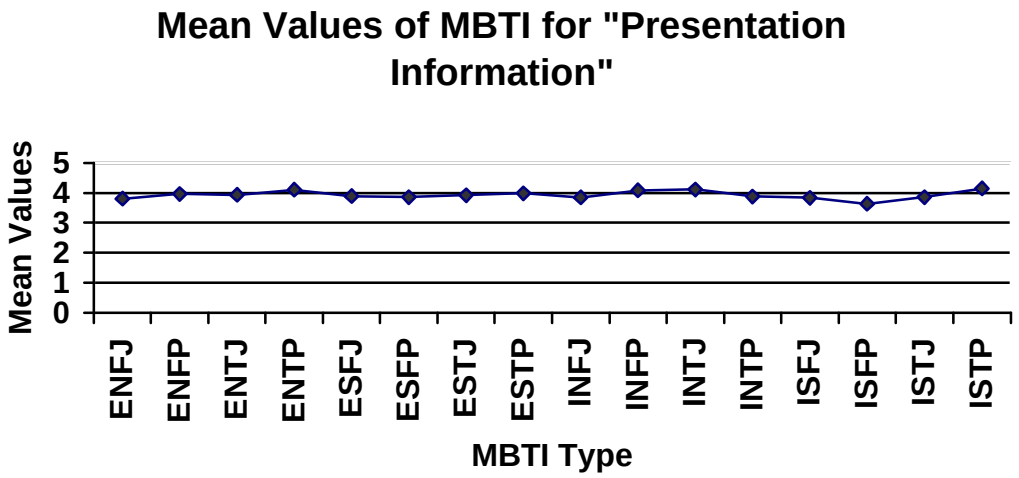


Figure K10. This chart shows the mean value for MBTI against a relevance criterion.

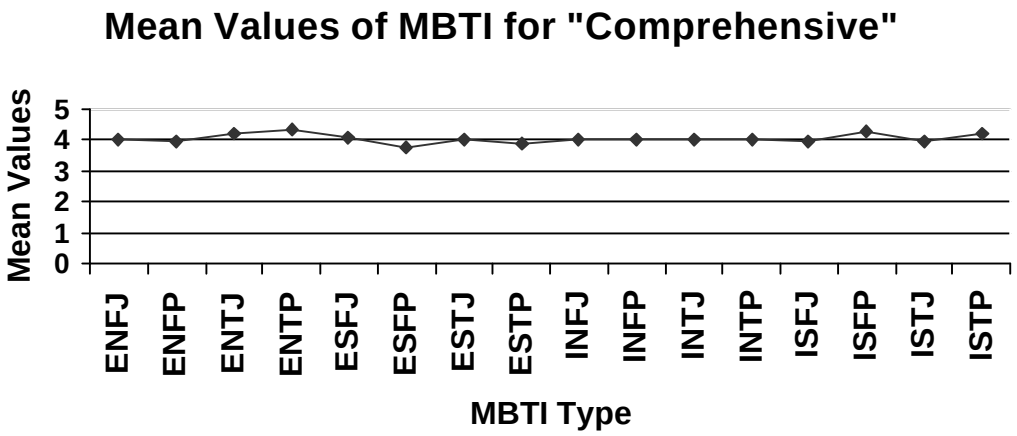


Figure K11. This chart shows the mean value for MBTI against a relevance criterion.

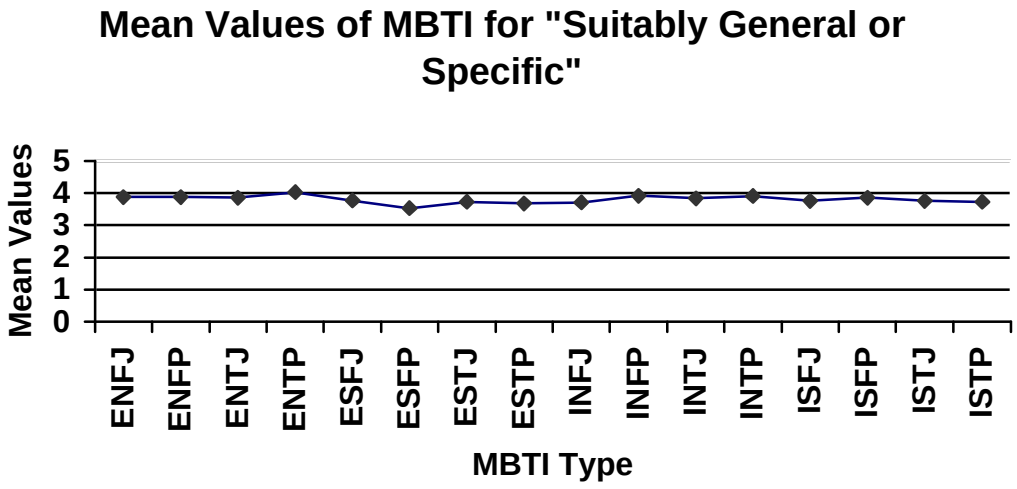


Figure K12. This chart shows the mean value for MBTI against a relevance criterion.

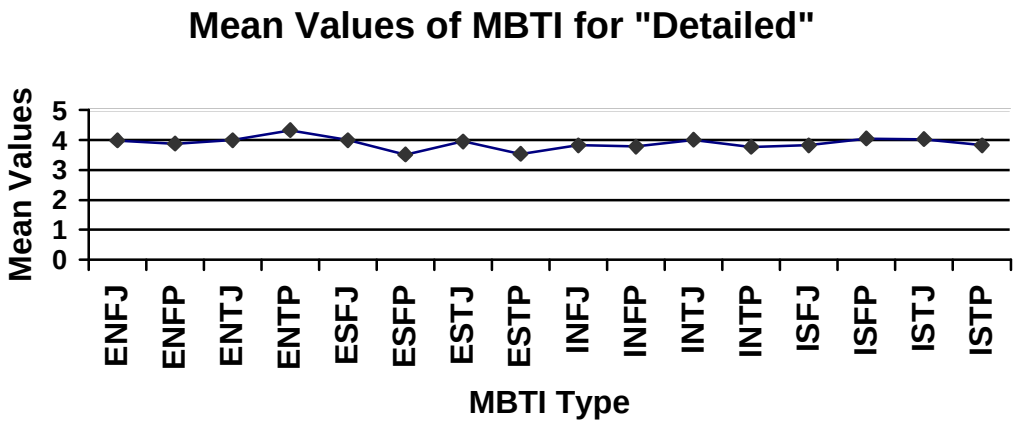


Figure K13. This chart shows the mean value for MBTI against a relevance criterion.

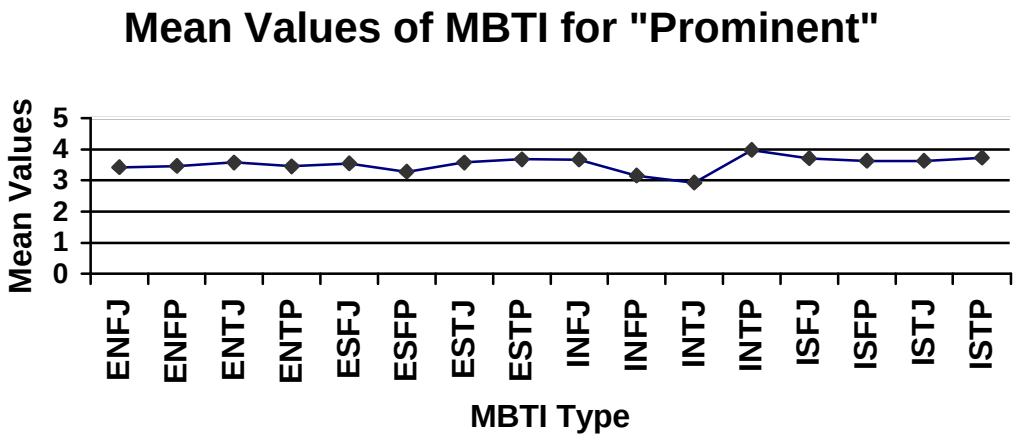


Figure K14. This chart shows the mean value for MBTI against a relevance criterion.

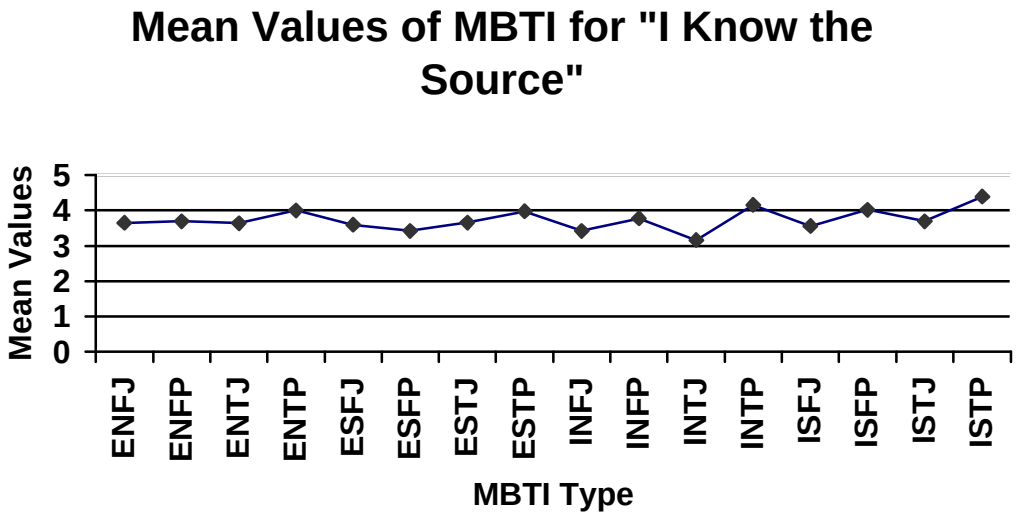


Figure K15. This chart shows the mean value for MBTI against a relevance criterion.

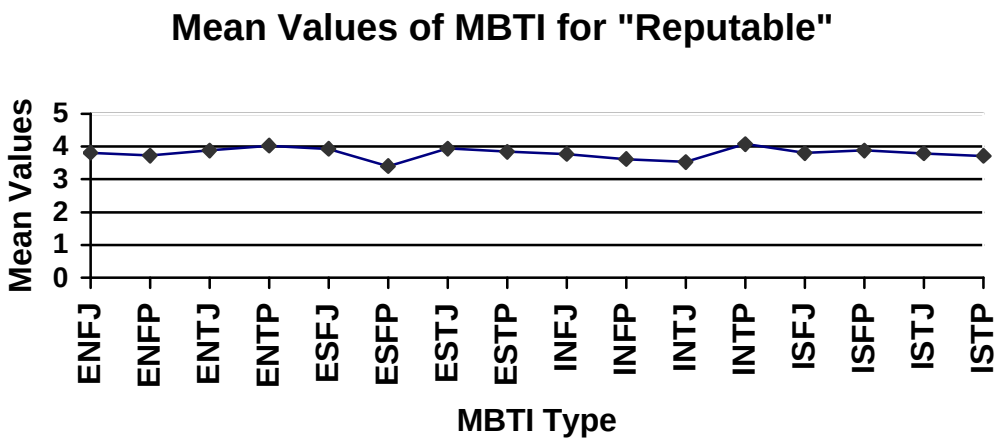


Figure K16. This chart shows the mean value for MBTI against a relevance criterion.

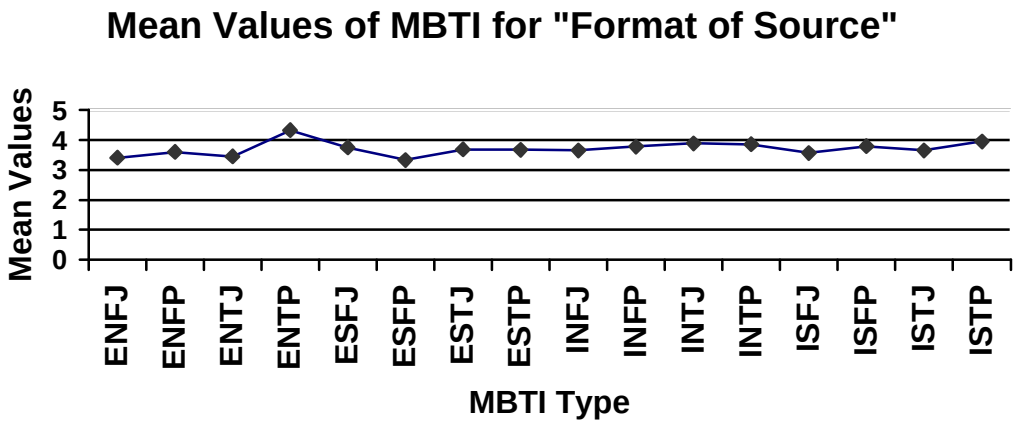


Figure K17. This chart shows the mean value for MBTI against a relevance criterion.

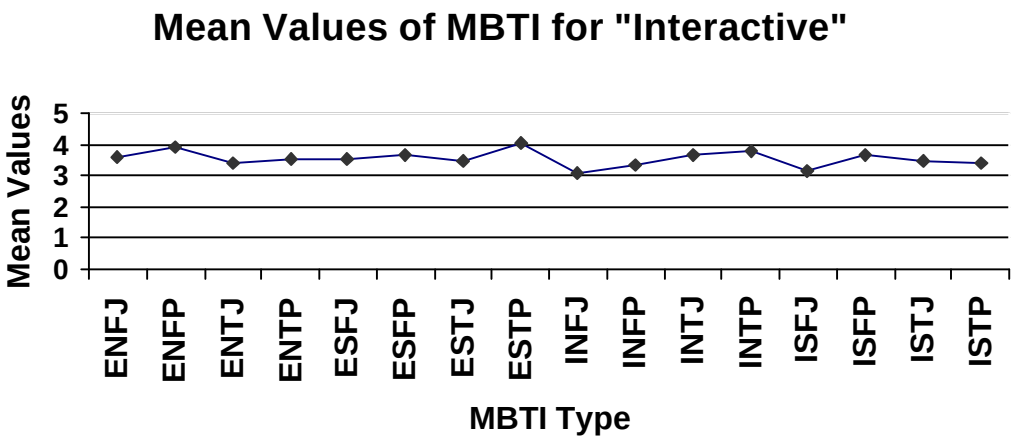


Figure K18. This chart shows the mean value for MBTI against a relevance criterion.

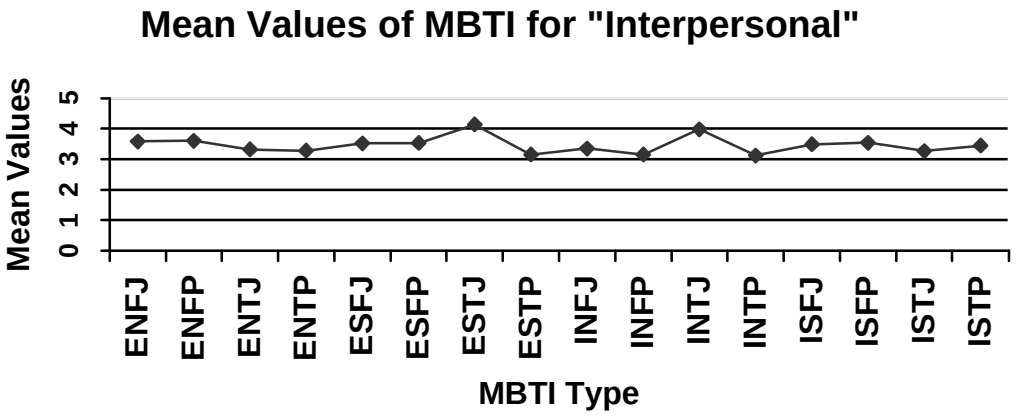


Figure K19. This chart shows the mean value for MBTI against a relevance criterion.

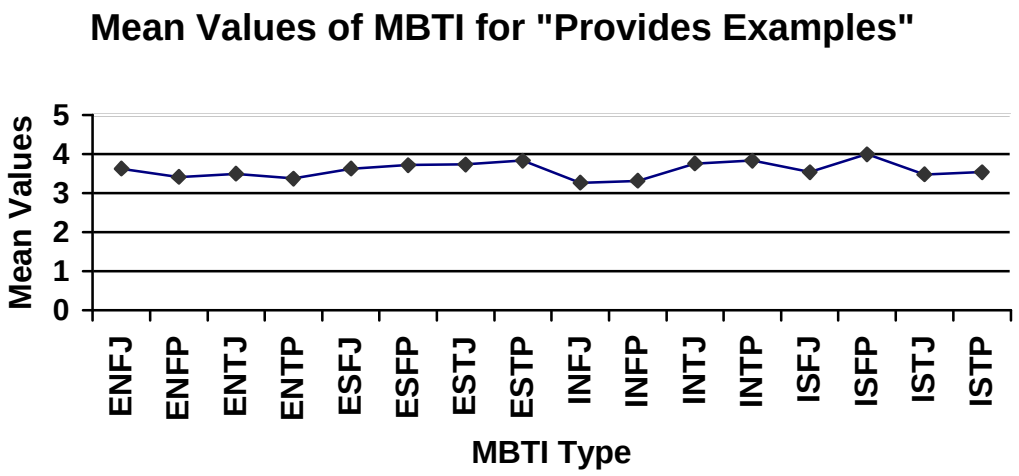


Figure K20. This chart shows the mean value for MBTI against a relevance criterion.

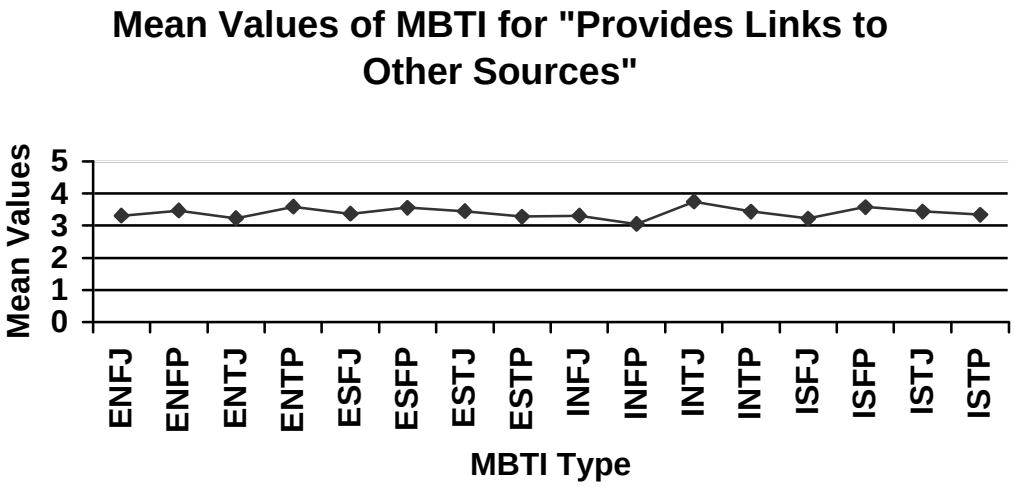


Figure K21. This chart shows the mean value for MBTI against a relevance criterion.

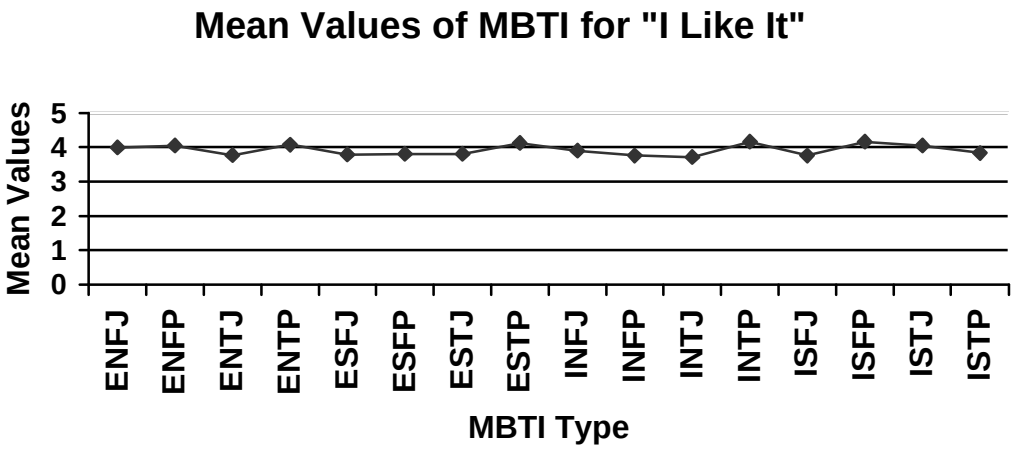


Figure K22. This chart shows the mean value for MBTI against a relevance criterion.

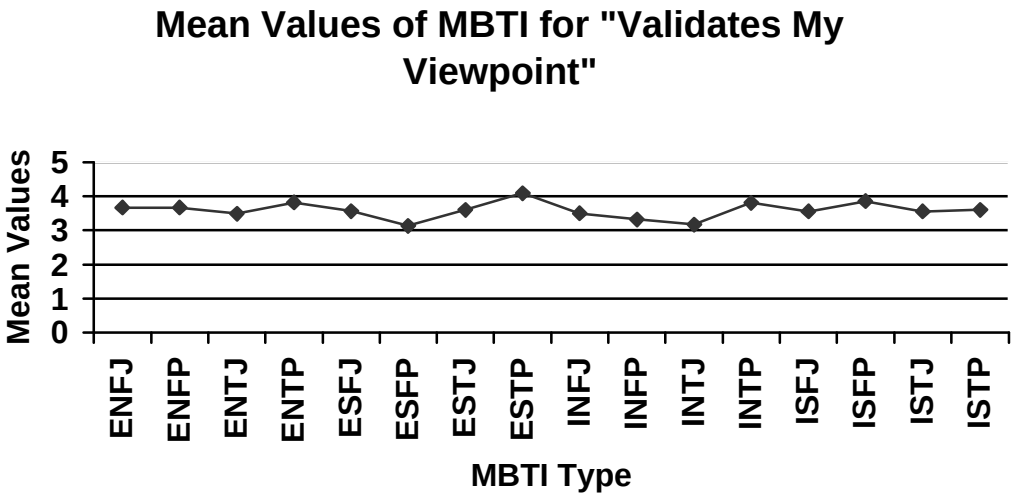


Figure K23. This chart shows the mean value for MBTI against a relevance criterion.

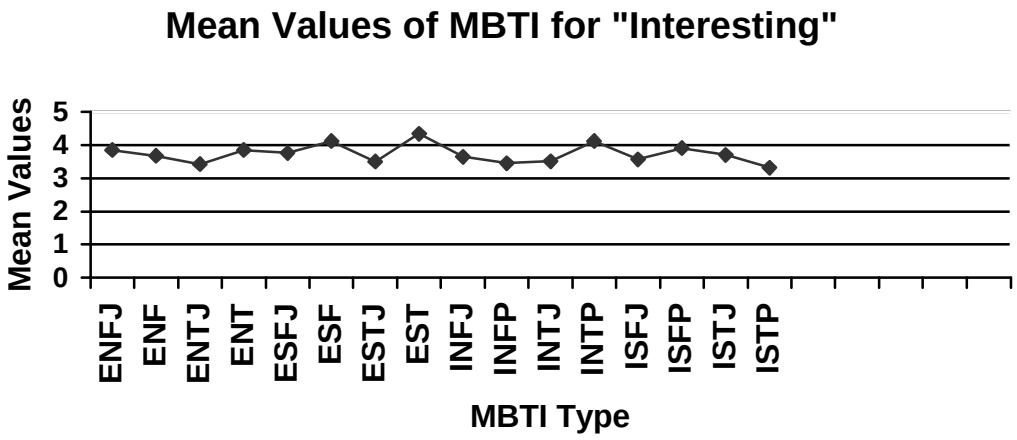


Figure K24. This chart shows the mean values for MBTI against a relevance criterion.

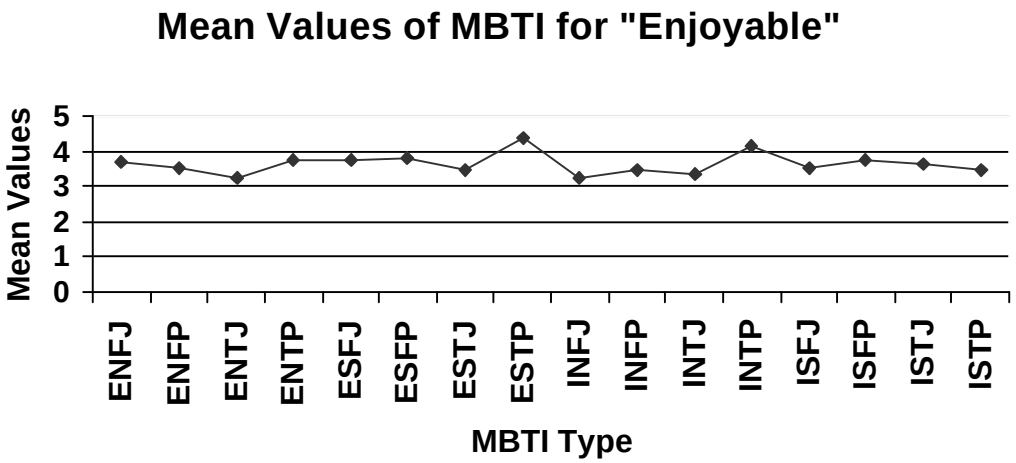


Figure K25. This chart shows the mean value for MBTI against a relevance criterion.

APPENDIX L

Venn Diagrams Showing the Intersection of Relevance Criteria for MBTI Type and Information Source

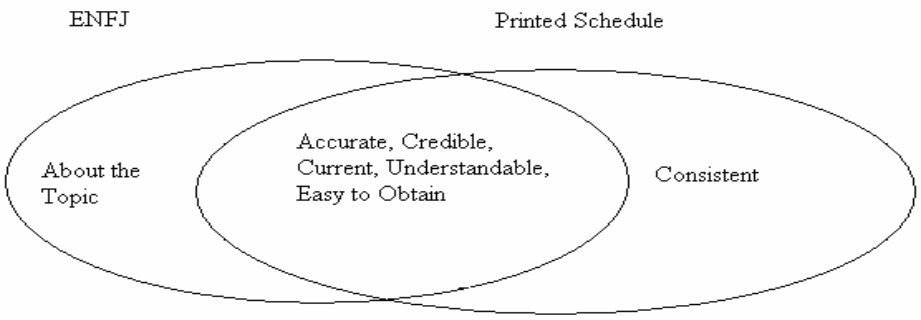


Figure L1. This Venn diagram shows the intersection of the top six relevance criteria for ENFJ type and the printed schedule.

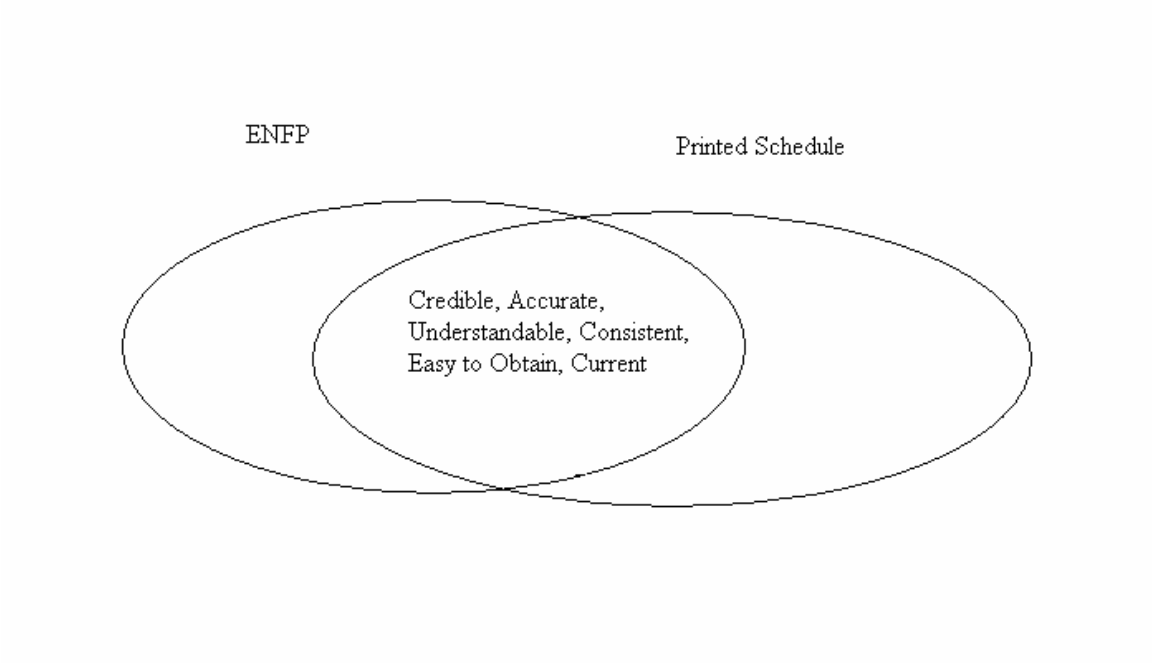


Figure L2. This Venn diagram shows the intersection of the top six relevance criteria for ENFP type and the printed schedule.

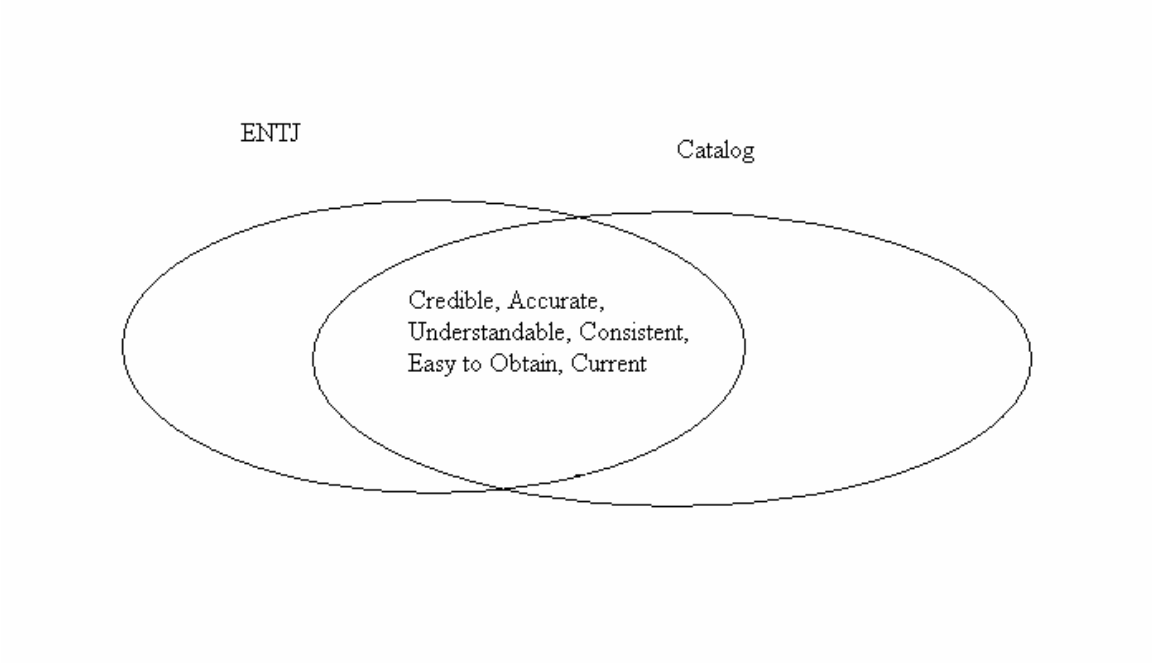


Figure L3. This Venn diagram shows the intersection of the top six relevance criteria for ENTJ type and the catalog.

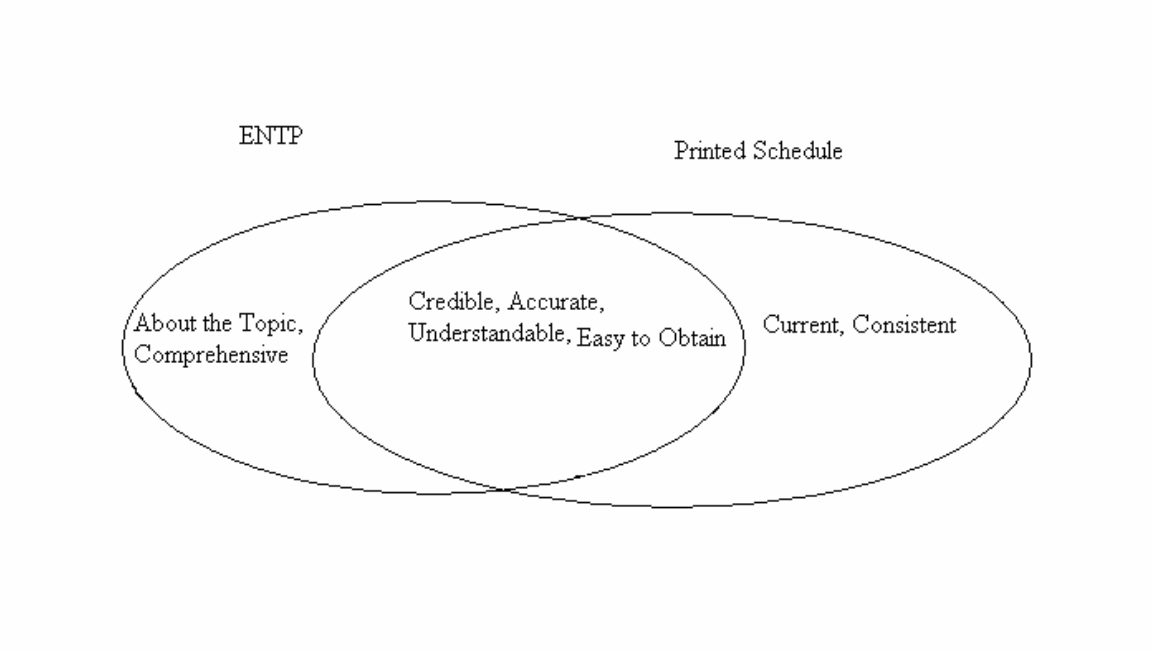


Figure L4. This Venn diagram shows the intersection of the top six relevance criteria for ENTP type and the printed schedule.

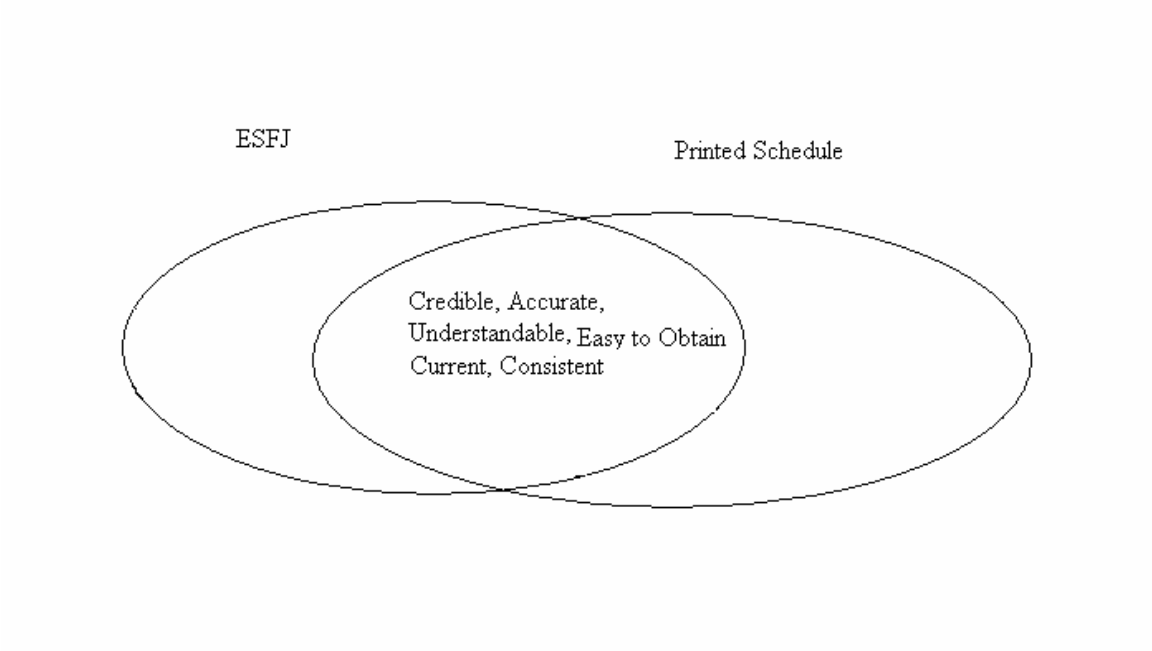


Figure L5. This Venn diagram shows the intersection of the top six relevance criteria for ESFJ type and the printed schedule.

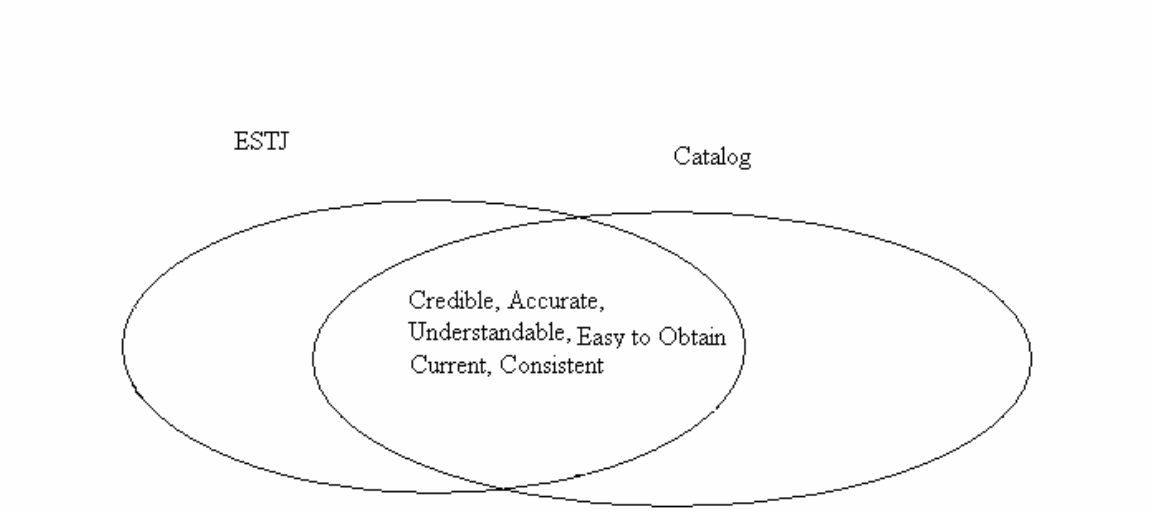


Figure L6. This Venn diagram shows the intersection of the top six relevance criteria for ESTJ type and the catalog.

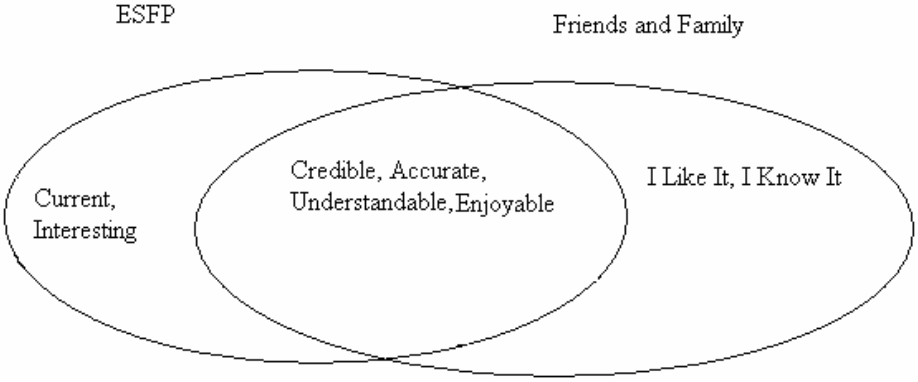


Figure L7. This Venn diagram shows the intersection of the top six relevance criteria for ESFP type and the friends and family.

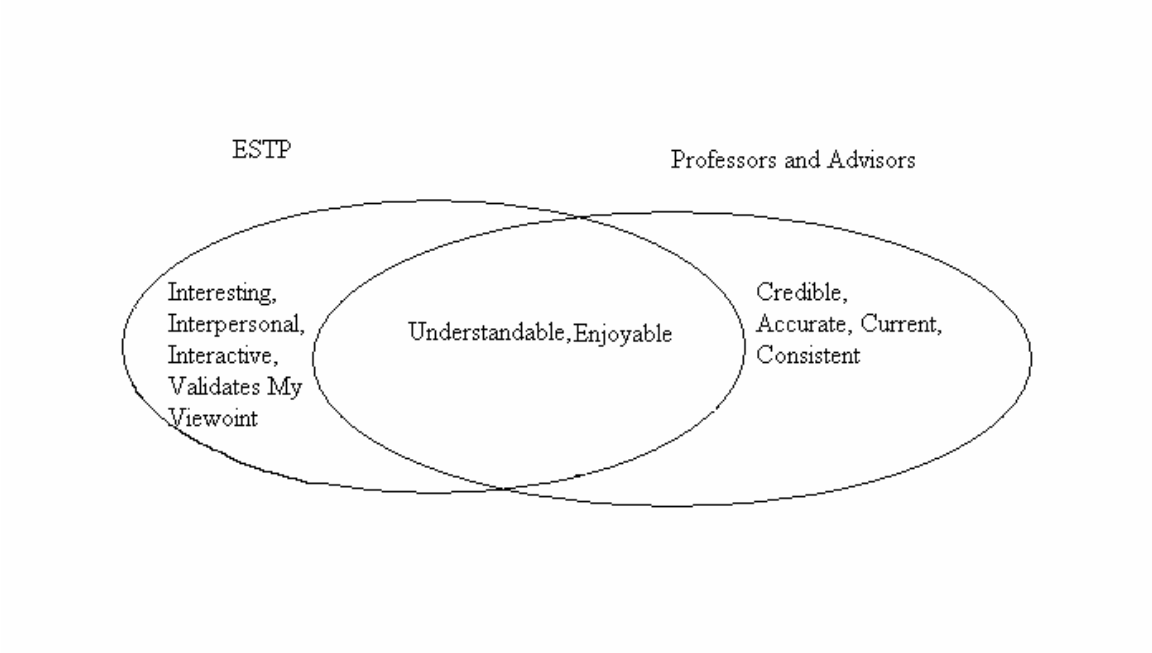


Figure L8. This Venn diagram shows the intersection of the top six relevance criteria for ESTP type and the professor and advisors information source.

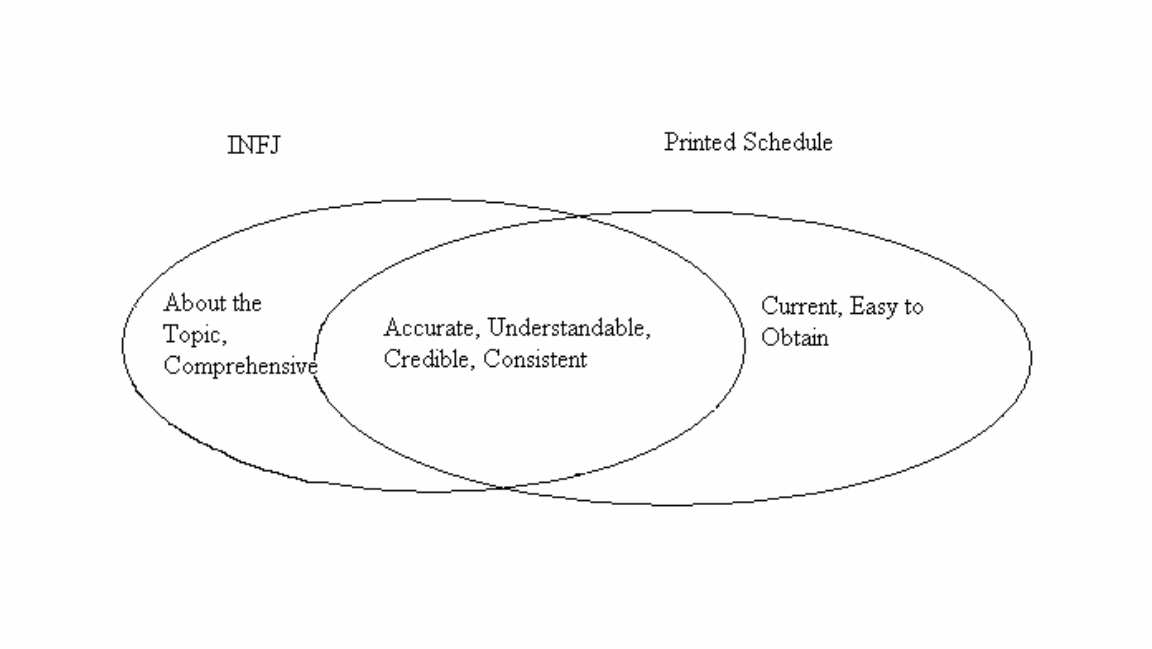


Figure L9. This Venn diagram shows the intersection of the top six relevance criteria for ENFJ type and the printed schedule.

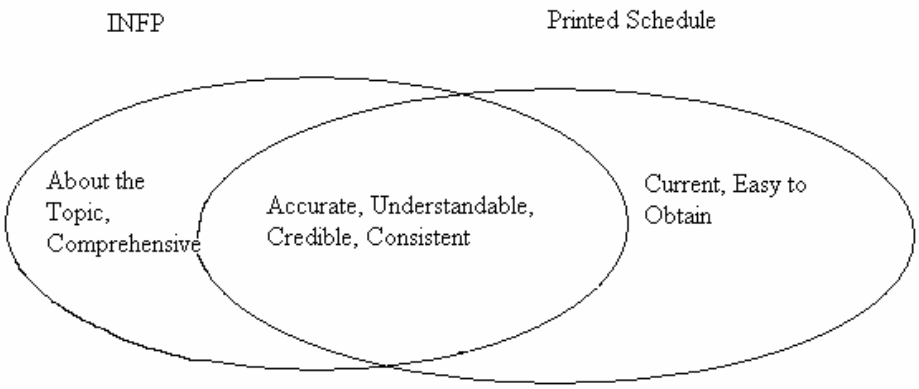


Figure L10. This Venn diagram shows the intersection of the top six relevance criteria for INFP type and the printed schedule.

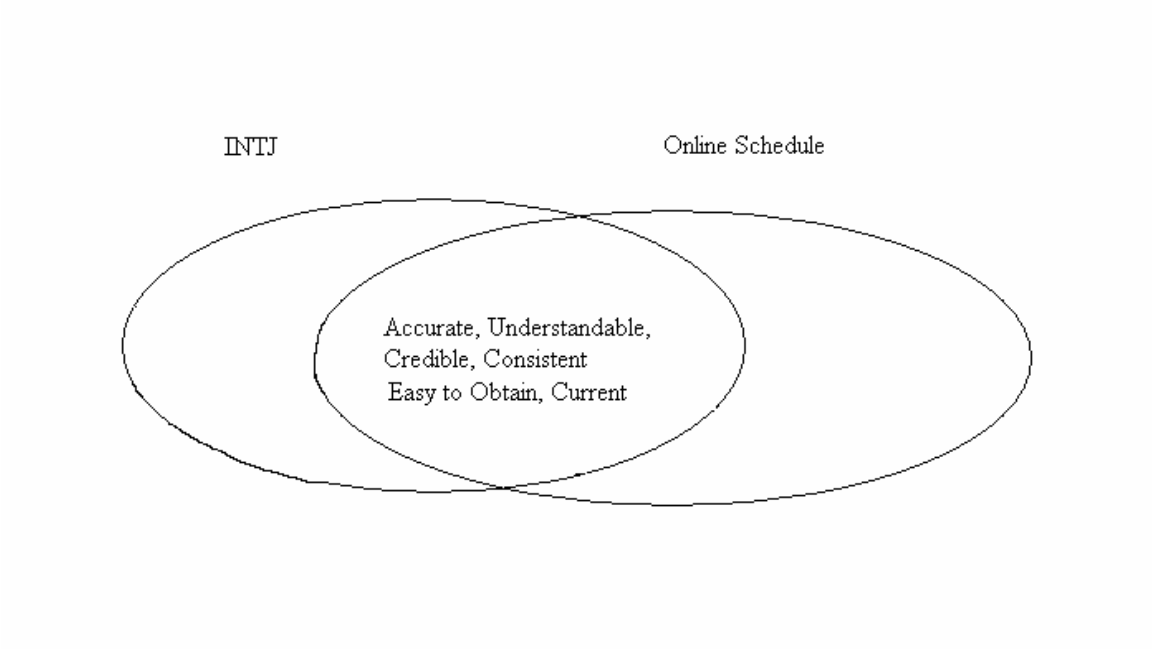


Figure L11. This Venn diagram shows the intersection of the top six relevance criteria for INTJ type and the online schedule.

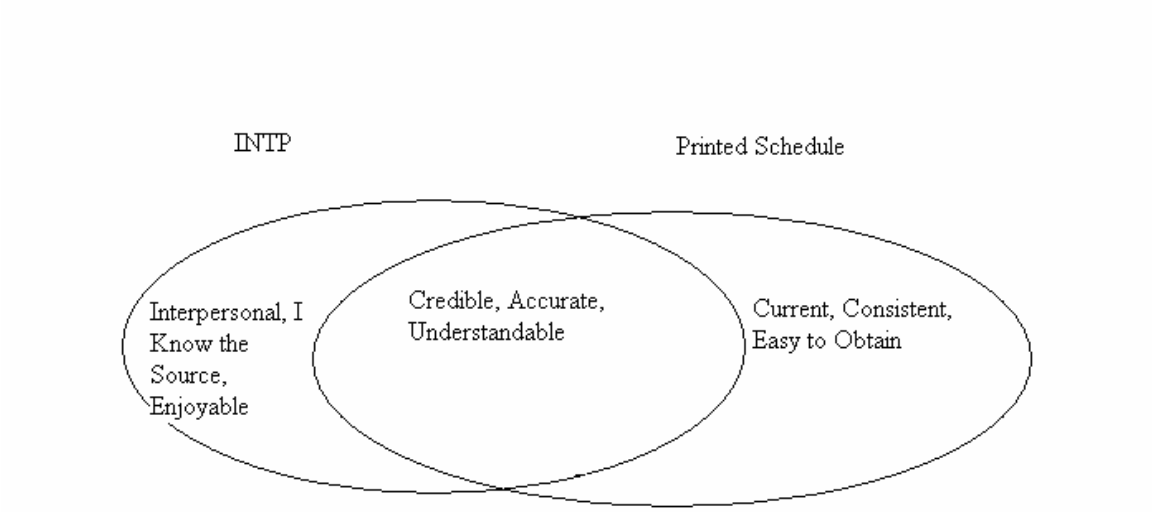


Figure L12. This Venn diagram shows the intersection of the top six relevance criteria for INTP type and the printed schedule.

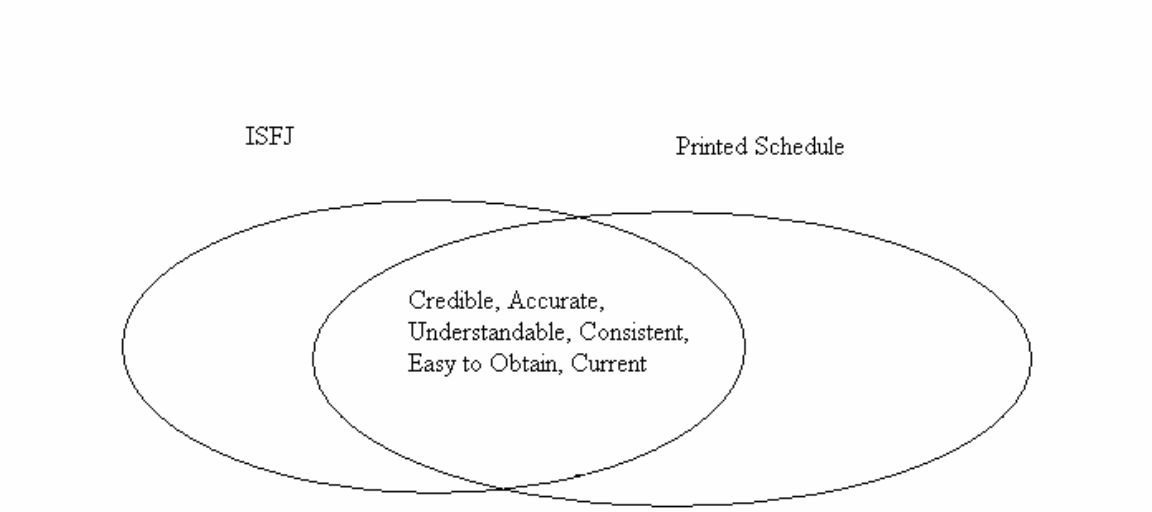


Figure L13. This Venn diagram shows the intersection of the top six relevance criteria for ISFJ type and the printed schedule.

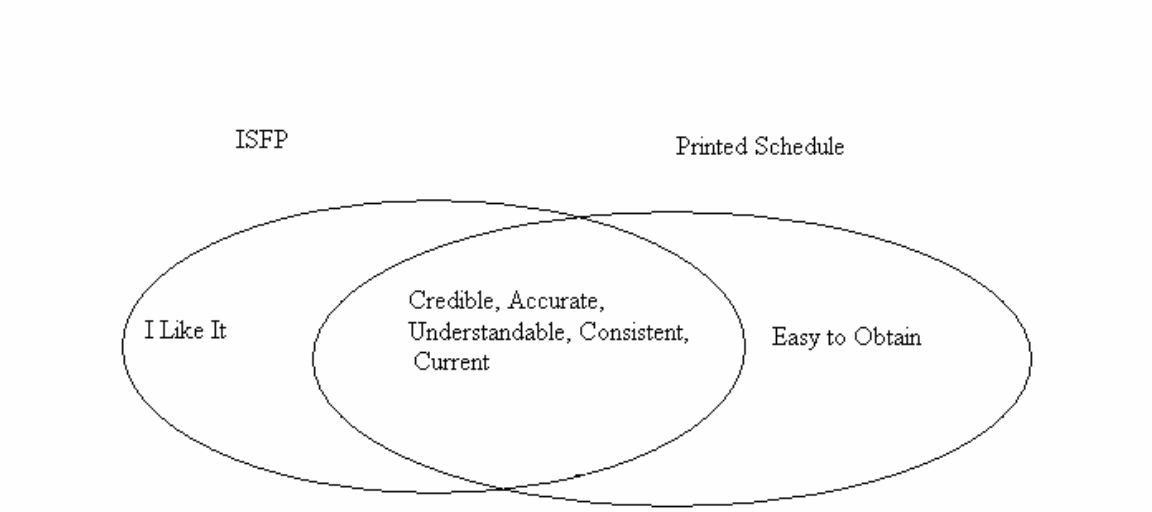


Figure L14. This Venn diagram shows the intersection of the top six relevance criteria for ISFP type and the printed schedule.

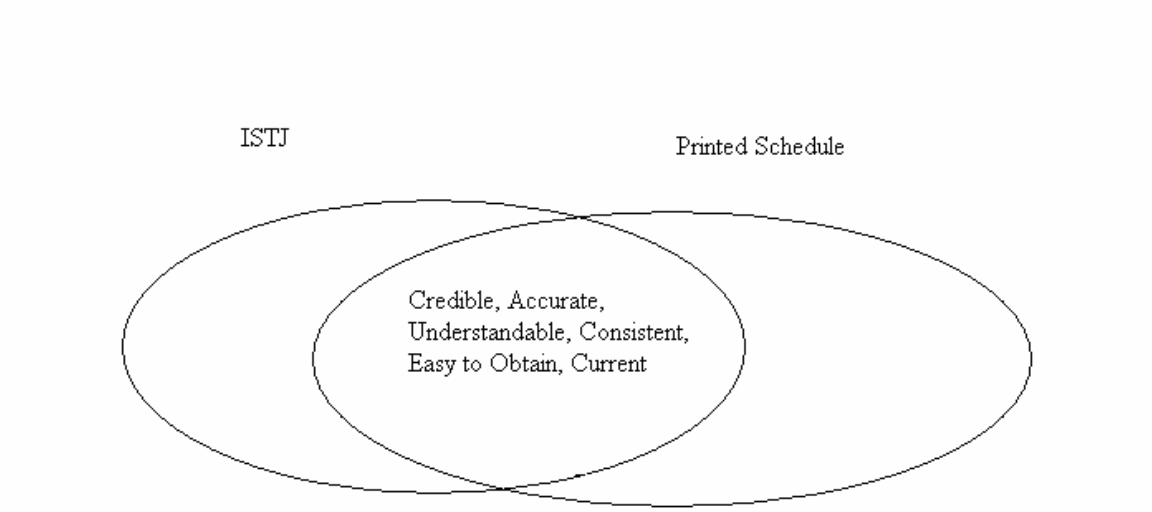


Figure L15. This Venn diagram shows the intersection of the top six relevance criteria for ISTJ type and the printed schedule.

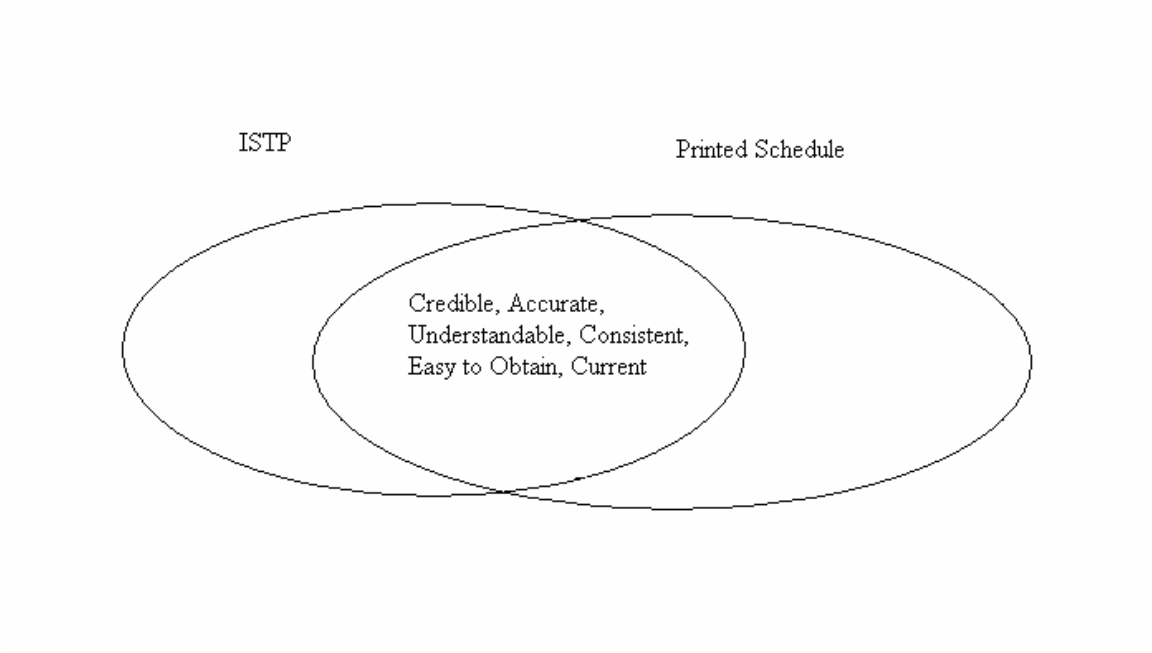


Figure L16. This Venn diagram shows the intersection of the top six relevance criteria for ISTP type and the printed schedule.

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